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MPhy
League of Nations Mixed Committee
on the Problem of Nutrition

NUTRITION

Final Report of the Mixed Committee
of the League of Nations

ON

THE RELATION OF NUTRITION
TO HEALTH, AGRICULTURE AND
ECONOMIC POLICY



Geneva, 1937

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League of Nations, Mixed Committee
" on the Problem of Nutrition

[Communicated to the Assembly,
the Council and the Members
of the League.]

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Geneva, August 14th, 1937.

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and Economic Policy.**

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PART I.

Chapter 1. — Introductory.

2. — A Century of Progress in Nutrition and Public Health.

3. — Summary and Conclusions.

Chapter 1.

INTRODUCTORY.

1. The Mixed Committee on the Problem of Nutrition was set up under a resolution of the sixteenth Assembly in 1935 to study both the health and economic aspects of the nutrition problem. It consists of agricultural, economic and health experts and includes also representatives of the Advisory Committee on Social Questions, the International Labour Organisation and the International Institute of Agriculture.¹

¹ The composition of the Committee was as follows:

The Viscount ASTOR (*Chairman*), member of the House of Lords, Chairman of the Milk-in-Schools Advisory Committee (under the Milk Marketing Board); formerly Parliamentary Secretary to the Ministry of Food and later to the Ministry of Health.

Baron G. ACERBO (representing the International Institute of Agriculture), President of the International Institute of Agriculture; former Minister; Dean of the Economic and Commercial Faculty in Rome University.

Professor Thure BJOERKMAN, Secretary-General of the Royal Agricultural Academy, Stockholm.

M. C. V. BRAMSNÆS (representing the International Labour Office), Director of the National Bank of Denmark; former Finance Minister, Copenhagen.

M. Ramon CANTOS, former Deputy in the Cortes, Madrid.

M. Léon DUPRIEZ, Secretary-General of the Belgian Economic Recovery Office; Professor of Political Economy at Louvain University; Director of the Institute of Economic Sciences at Louvain, Belgium.

Dr. L. FEIERABEND, President of the Grain Monopoly, Prague.

M. Casimir FUDAKOWSKI, Senator; former President of the Polish Federation of Chambers of Agriculture; Vice-President of the International Agricultural Commission; Member of the Economic Committee of the International Institute of Agriculture, Warsaw.

M. Enrique J. GAJARDO (representing the Child Welfare Committee), Head of the Permanent Bureau of Chile at the seat of the League of Nations.

M. Jules GAUTIER (deceased November 24th, 1936), Vice-President of the International Agricultural Commission, Paris.

M. Edo MARKOVIC, General Manager of the Privileged Joint Stock Company for the Export of Products of the Kingdom of Yugoslavia, Belgrade.

Professor E. V. MCCOLLUM, Professor of Biochemistry, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, United States of America.

Mr. F. L. McDUGALL, Economic Adviser to the Australian Government, London.

Sir Edward MELLANBY, Secretary-General of the Medical Research Council, London.

[Note continued on page 10]

The Assembly resolution made express provision for the co-operation of these two last-mentioned organisations, in view of the nature of their activities and interests.

2. The Assembly resolution resulted from a growing recognition of the importance of taking active measures to improve nutrition to which expression was given by a number of delegates during the debate on the subject. It was thought that the time had come for the League of Nations to make a thorough investigation of the

M. G. DE MICHELIS, Ambassador; Senator; Member of the National Research Council, etc., Rome.

Professor Edwin G. NOURSE, Director of the Institute of Economics, Brookings Institution, Washington.

Dr. Carlos A. PARDO, Commercial Counsellor at the Argentine Legation in Switzerland, Berne.

M. H. QUEUILLE, Senator; former Minister of Agriculture and former Minister of Public Health, Paris.

M. VAN RIJN (representing the International Institute of Agriculture), Vice-President of the International Institute of Agriculture, Rome.

M. STEVENS, Engineer; Inspector of Agriculture; Head of the Agricultural and Economic Information Department of the Ministry of Agriculture, The Hague.

Dr. Faith WILLIAMS (representing the International Labour Office), Chief of the "Cost of Living Division", Department of Labour, Washington.

* * *

M. HALBWACHS, Professor at the Sorbonne, Paris, took the place of Dr. Faith Williams at the first session, and of M. Bramsnaes at the second session.

M. Jan WSZELAKI, Economic Counsellor at the Ministry for Foreign Affairs, Warsaw, took the place of M. Fudakowski at the first session.

Mr. Warren C. WAITE, Professor at Minnesota University (United States of America), and Mr. Harold B. ROWE, of the Brookings Institution, Washington, took the place of Professor Nourse, the former at the first session and the latter at the second session.

M. DE MICHELIS and Baron ACERBO did not attend.

M. AUGÉ-LARIBE, representative for France and the French colonies on the Permanent Committee of the International Institute of Agriculture, attended as substitute at the first session, and replaced Baron Acerbo at the third.

Miss Charlotte WHITTON, Director of the Canadian Welfare Council, Representative of the Advisory Committee on Social Questions, which absorbed the Child Welfare Committee in January 1937, replaced M. Gajardo at the third session.

M. J. L. DE LA LOMA Y OTEYZA, chief of the Statistical, Economic and Agricultural Policy Section at the Ministry of Agriculture, took the place of M. Cantos at the third session.

Professor BJOERKMAN, M. DE MICHELIS, Dr. PARDO and M. STEVENS were unable to attend the third session.

The representatives of the International Institute of Agriculture were on one or more occasions assisted by:

M. BRIZI, Secretary-General of the Institute;

M. DORE, Head of the Bureau of General Statistics;

Dr. PAVLOVSKY, Head of the Bureau of Economic and Social Studies.

work being carried out in the interest of improved nutrition in a number of countries, this investigation to cover at once the dietetic and economic aspects of the problem.

3. The world had just experienced the evils of a long and severe economic depression. The production of all kinds of foodstuffs had been steadily increasing; markets were glutted and producers were faced with ruin; at the same time, careful enquiries in a number of countries had shown how extensive was the failure to satisfy normal nutritional requirements. Indeed, while owners of food stocks were unable to find remunerative markets, some parts of the world were suffering from famine; in others, large sections of the population were suffering from serious malnutrition. This malnutrition, moreover, was not confined to the poorest classes. Wherever this state of affairs was found to exist, it caused the most serious apprehension, not merely on humanitarian grounds, but also because of its possible effect upon the social structure and internal peace of the countries concerned.

4. Hence the question naturally arose whether it was not the duty of the public authorities to assume the responsibilities inherent in a "nutrition policy"; to elaborate such a policy and apply it in such a manner as at once to benefit agriculture and promote public health; to combat malnutrition and, in so doing, to afford some measure of relief to the agricultural depression, especially by increasing the consumption of the so-called "protective" foods which enable men, women and children to obtain full physical and mental development, at the same time increasing their resistance to many diseases (*e.g.*, scurvy, beri-beri, rickets and other bone defects; dental caries; tuberculosis and bronchial pneumonia, which so often develop from measles, whooping-cough and other children's diseases; and also to such conditions as anæmia, night-blindness, etc.).

5. Although the concern of Governments in improved nutrition is by no means new, action has in the past generally been limited in scope. In the discussions of the seventeenth Assembly, it was suggested that it was the duty of the public authorities to extend their sphere of action. This new conception was due to research conducted over a long series of years by individuals in a number of countries. Since 1925, it has received an impetus from the Health Organisation of the

League of Nations, which has been engaged upon enquiries, conducted frequently on the spot, in regard to the state of nutrition in various parts of the world. These investigations, which were gradually extended from one question to another, culminated in 1935 in a general report on nutrition ¹ which attracted considerable attention. This report, which was the work of Dr. E. Burnet and Dr. W. R. Aykroyd, was intended primarily for national health authorities, and was devoted in the main to a consideration of the importance of nutrition in public health and preventive medicine. Its authors came to the conclusion that nutrition was no longer an exclusively physiological problem and that henceforward, it must be a matter of concern to both public health officers and economists.

6. The Assembly's intention, in deciding upon an international enquiry into this matter, was not to supply the Governments with ready-made or uniform solutions, but rather to enable them to work out solutions for themselves by adapting such conclusions as might be reached by the Mixed Committee to conditions in their respective countries. The Assembly also desired to put public opinion in possession of the most recent information on this subject and to draw the attention of public authorities to a task which, if somewhat neglected in the past, is likely to demand more and more of their attention.

7. The Mixed Committee entered upon its duties in February 1936; the first session was held from February 10th to 16th and the second from June 4th to 7th, 1936. Its initial findings were recorded in an interim report, which is briefly analysed in paragraphs 12 and 13 below.

8. The International Labour Office had already taken up the problem of nutrition and had examined certain of its aspects from its own particular point of view. In pursuance of a resolution adopted at the nineteenth session of the International Labour Conference (June 1935), it published in May 1936 a general report on "Workers' Nutrition and Social Policy".²

¹ Published in Volume IV, No. 2, June 1935, of the *Quarterly Bulletin of the Health Organisation*.

² "Workers' Nutrition and Social Policy": Studies and Reports (Social and Economic Conditions), No. 23, International Labour Office, Geneva, 1936. 249 pages.

In this report, emphasis is laid on the fact that "large numbers of the working population, not only in impoverished or depressed areas, but even in the most advanced industrial countries, are inadequately nourished. Such malnourishment and under-nourishment are not the result merely of temporary dislocation due to an industrial depression, though a depression usually has an aggravating influence. It is a condition found among many employed workers in times of normal business activity." The report enquires into the causes of this state of affairs. It describes what has been done to mitigate it.

9. The Mixed Committee found this report of the greatest value in regard to one of the most important points in its own programme of work. It also made use of a great variety of material obtained from a number of different sources. Some thirty countries supplied information regarding the state of nutrition of their own people and the action taken in this connection by public or other authorities. This material,¹ which related to countries of different social and economic structure, enabled the Committee to view the problem from different angles.

10. At the request of the Mixed Committee, the International Institute of Agriculture at Rome also conducted a special study on production, consumption and price statistics, which was published as Volume IV of the Committee's interim report. By the terms of the Convention that established it, that Institute is specially qualified to represent agricultural interests in any attempt to secure a harmonious adjustment between production and consumption. Its general assembly already mentioned laid stress upon the fact that it was in the farmer's true interest to satisfy the consumer's needs, as regards both quantity and quality; it urged the Permanent Committee of the Institute to neglect no single aspect of the nutrition problem as it affects agriculture, and especially to study its possible influence on agricultural production, the division of crops, the feeding of the peasant classes, the supplying of markets, etc. For this general survey, which entails a study of present conditions in the hope of discerning future trends, statistical material is an essential basis. Unfortunately, that material is far

¹ League of Nations: "The Problem of Nutrition", Vol. III.

from complete; the International Institute of Agriculture is doing its utmost to make good this deficiency.

11. The Committee had also before it the results of the enquiries conducted by the Health Organisation of the League of Nations. In addition to the Burnet-Aykroyd report referred to above, special mention must also be made of another document of first importance—namely, the “ Report on the Physiological Bases of Nutrition ”, drawn up by a Commission of scientists of worldwide reputation. The findings of this report form the scientific basis of the Committee’s work; they set out the principles of rational nutrition in the present state of scientific knowledge, and specify the nutritional requirements of the individual at the various stages of his development. It has been rightly said that the work of this Commission constituted an important date in the history of the science of nutrition.

12. In June 1936, shortly before the Assembly, the Mixed Committee published its interim report in four volumes. The report proper (Volume I); the “ Report on the Physiological Bases of Nutrition ” (Volume II); “ Nutrition in Various Countries ” (Volume III), which is a digest of the information supplied by the countries concerned or obtained from other sources; “ Statistics of Food Production, Consumption and Prices ” (Volume IV), compiled by the International Institute of Agriculture, Rome.

13. The Committee considered it expedient to submit this interim report before completing the whole of its investigations, as it was anxious to focus attention at once on certain aspects of the problem and to stimulate action. The report was accordingly devoted primarily (i) to explaining the new conceptions which, in the opinion of scientists, should govern human nutrition and to showing the effects of disregarding these rules and (ii) to the framing and exposition of a series of recommendations which it suggested might constitute the general guiding principles of national nutrition policies. In framing these recommendations, it made it clear that they were not intended to be more than suggestions which would require to be adapted to national conditions.

The economic and agricultural aspects of the problem, referred to briefly in the interim report, were reserved for fuller treatment later. The present report is primarily concerned with them.

14. The report submitted in 1936, although only provisional aroused very general interest. The welcome given to it by public opinion, to judge from the Press comments in many countries, shows the importance attached to this question, with which the tranquillity of the world is so closely linked. The Mixed Committee's work came at the right moment and strengthened the efforts of the many national organisations which are trying to initiate action along these lines or to further such action where it is already being taken.

15. The seventeenth Assembly endorsed the guiding principles of policy put forward by the Mixed Committee and recommended their adoption by Governments. At the same time, it decided to give a fresh impetus to the studies undertaken, both those devolving on the Mixed Committee and those of a more specialised nature which fall to the Health Organisation. Among the recommendations endorsed was one to "co-ordinate the work done by different authorities which affects the nutrition of the people and, in the absence of a central authority, to set up a special body for this purpose in order to secure unity of policy and direction". With a view to co-ordinating the activities of these committees—some of which had already been set up—the Assembly suggested that it might be well to arrange for an exchange of views and experience between their leading members.

16. A meeting of representatives of a number of National Committees was accordingly held at Geneva from February 22nd to 26th, under the chairmanship of Lord Astor. The agenda was confined to the following points:

1. Status and composition of National Committees;
2. Work already done and in progress; methods to be employed in order:
 - (a) To assess the state of nutrition of the national population;
 - (b) To spread the principles of improved nutrition among the population.

Each of these points afforded an opening for interesting discussions. Those present at the meeting described what had been done in their respective countries to introduce new food-consumption habits, to improve the state of public health and maintain the improvement when secured. A wide variety of methods has been employed, but there is general agreement on the need for spreading a knowledge of the value of protective foods and of the importance of a correct balance in the daily diet. Much striking evidence was produced of the effect of such a balance on health and growth, especially in the case of children, but there is equally abundant and striking evidence that an " optimum condition " is rare, not to say exceptional.

17. The composition and status of National Committees vary in different countries; indeed, rigid standardisation would make them unadaptable to national conditions. The members of the meeting unanimously agreed, however, that those bodies should be so constituted as, in the Assembly's words, " to secure unity of policy and direction ". One essential condition for this seems to be that they should be incorporated in the State administrative organisation. A National Committee that depends entirely on private initiative for its driving power and its finances, as some do, is undoubtedly not in a position to perform its functions satisfactorily.

On the other hand, National Committees are likely to be greatly strengthened by the addition of members who are not Ministers of State or State officials.

In some countries, the creation of non-Governmental committees alongside the official National Committee may prove of real value.

18. It is plain that a national nutrition policy must be based on periodical enquiries into food-consumption habits. The methods generally employed to determine the state of nutrition of the population were discussed at length and a number of principles and rules for guidance embodied in an *aide-mémoire* which will, it is hoped, be elaborated by a technical committee of the League's Health Organisation. As long ago as 1926, the International Labour Office held a conference of labour statisticians, and published a report on methods of securing and analysing data on consumption of food and other goods and services by workers. The expert members of the Committee advising the International Labour Office

on nutrition have recently recommended to the Governing Body of that Organisation to arrange for a further international discussion on the subject in collaboration, especially, with the experts of the League Secretariat and of National Nutrition Committees. The Committee attaches importance to effective co-operation between these organisations in order to improve the methods used in such investigations and, in the interest of international comparisons, to secure their greater uniformity.

19. Since the publication of the Mixed Committee's interim report, the Health Organisation of the League of Nations has undertaken a series of relevant studies. It is thus making a valuable contribution to our knowledge of the general problem, the scientific aspect of which still offers great openings for research.

20. The authors of the report on "The Physiological Bases of Nutrition" already mentioned recommended, when submitting their conclusions, the following ten problems for further study:

1. Assessment of the nutritional state of children.
2. Nutritive food requirements during the first year of life.
3. Minimum vitamin and mineral requirements.
4. Minimum fat requirements.
5. The nutritive and "supplementary" values of the different protein-containing foods, to determine to what extent and in what forms animal protein is necessary for growth and health.
6. The relative nutritive value of different cereals according to the degree of milling.
7. The extent to which the increasing consumption of sugar is detrimental to health.
8. Influence of climate on food requirements.
9. The extent to which diets in common use fall below the standards recommended in this report.
10. The optimum amounts of milk required at different ages.

This list was later amplified by a proposal for special investigations on the subject of milk, more particularly the additional nutritive effects of the reciprocal action of the dietetic elements contained in milk on the one hand, and cereals and potatoes on the other.

21. The first of the subjects mentioned above—assessment of the nutritional state of children—was considered at a meeting of experts held in Geneva in December 1936. These experts recommended

several types of enquiry according to the number of children whose state of nutrition was to be examined.

As a first type of enquiry, aiming at the rapid classification of a large number of individuals, they suggested that cards should be compiled showing age, sex, physical appearance, weight, height, and the results of a simple clinical examination. A second type of enquiry, involving more thorough examinations and covering a smaller number of individuals, includes, in addition to the tests employed in the first type, an economic and social investigation (more especially into the diet of the family and the child), a thorough medical examination, and a series of tests, particularly tests for latent predeficiency in vitamins A, C and D. A third type of enquiry aims at the scientific study of the influence of a quantitatively or qualitatively deficient diet on all the functions of the organism, both physical and mental. Enquiries of all these kinds are now being conducted in certain countries. In Sweden, they are to cover 50,000 children; in Czechoslovakia, 10,000; and in Austria, 20,000. Similar investigations have also been in progress for some time in the United States of America, the United Kingdom, Poland and Norway.

22. A second group of experts, which consisted chiefly of pediatricists, devoted its attention to determining the nutritional requirements during the first year of life, more especially in calories, proteins, carbohydrates, fat, mineral salts and vitamins. It set out its findings on the length of the period of breast feeding and of artificial feeding, on the administration of orange-juice, tomato-juice and cod-liver oil, and on the use of cereals, broth, vegetables and eggs in the diet of infants.

23. The experts of the Health Organisation decided, moreover, to arrange for the study of the following three questions:

(a) Has the daily administration of more than 750 c.c. of cow's milk to children between six months and one year any unfavourable influence on the nutritive exchanges and, in particular, on the absorption of calcium and iron ?

(b) What are the differences between the action of an artificial preparation of an irradiated sterol and that of irradiated milk, when quantities containing the same number of international units of vitamin D are administered ?

(c) Is it desirable to provide systematic preventive treatment against anæmia for all children between four months and one year by the administration of an iron salt ?

All the other problems mentioned in points 3 to 10 above are being studied by scientific institutions and learned societies in a number of countries. This procedure has been adopted in order to allow of full consideration being given to differences in geographical, economic and social conditions.

24. Finally, experts in several countries have studied the methods adopted for providing the population—more particularly nursing mothers, infants at the breast and children—with an abundant supply of milk which, as a result of the technical supervision of its production and the methods of preservation and distribution, can be relied upon to be pure.

These studies are a continuation of those which have been on the Health Organisation's programme for the past six years and on which several publications have already appeared.¹

The report on the investigations of these experts, which will be issued shortly, considers the milk problem in its various aspects—nutritional, economic, social, veterinary and medical, all of which must be borne in mind in attempting to define a national milk policy.

The results of these studies on such an essential food as milk constitute, in regard to a large number of countries, a source of information the value of which can scarcely be overrated.

* * *

25. The International Labour Organisation, for its part, was not inactive. Two resolutions adopted at the Conference at Santiago de Chile in January 1936, which was attended by the American States Members of that Organisation, recommended a series of studies and surveys on the nutrition of workers. In June 1936, the International Labour Conference (twentieth session), after discussing the Office's initial report on "Workers' Nutrition

¹ "Milk Hygiene in the Department of Meurthe-et-Moselle", by J. PARISOT, P. MELNOTTE and L. FERNIER (*Quarterly Bulletin of the Health Organisation*, Vol. III, No. 4).

"The Milk Supply of North-American Cities", by R. BURRI (Switzerland) (*Quarterly Bulletin of the Health Organisation*, Vol. I, No. 1).

"The System of Grading Milk in the United States of America", by Dr. G. S. WILSON (London) (*Quarterly Bulletin of the Health Organisation*, Vol. I, No. 4).

and Social Policy ", expressed the view " that the nutrition of the workers should be considered as one of the most important problems which the International Labour Organisation has to solve ". At the same time, it invited the International Labour Office to continue its studies in this field.

26. Several other international organisations have shown by their discussions and expressed in resolutions the importance attached by them to the Mixed Committee's work and their desire to co-operate. As already mentioned, a representative of the Advisory Committee on Social Questions sits on the Mixed Committee. A delegate of the International Committee on Inter-co-operative Relations was also asked to attend the proceedings of the Mixed Committee in 1937. The reports of this Committee on Inter-co-operative Relations described the efforts which co-operative organisations have employed to enlighten and guide their members, both consumers and producers, on nutrition questions. We desire to draw attention to the help which these bodies can give to public authorities in their efforts to promote nutrition and to suppress fraud. The League's Advisory Committee on Social Questions has, in execution of the seventeenth Assembly's decision, placed on its agenda the study, in collaboration with the Health Organisation and the International Labour Office, of the social effects of malnutrition on children of both rural and urban populations. The International Commission of Agriculture, at a meeting held in July 1936 at Oslo, stressed particularly the economic importance of the problem and the need for a thorough study of the food position of the agricultural populations in connection with agricultural depression and unemployment. Lastly, the General Assembly of the International Institute of Agriculture, held in October 1936, decided to strengthen its collaboration with the Mixed Committee and laid down the lines of its own work and investigations on the subject of nutrition.

27. The Mixed Committee has also received ample evidence of the close attention paid to its work by many private organisations and associations.

28. All these various bodies and interests, inspired by a common aim, have given valuable support to the Mixed Committee. The latter can regard its task as completed if its conclusions furnish

all those interested in the problem with a basis for a working programme designed to secure greater health and prosperity.

29. The Mixed Committee held its third and final session from April 12th to 17th, 1937, and approved the contents of its final report. It charged a Drafting Committee with the task of final editing; the Drafting Committee met from June 11th to 13th, 1937, and approved the report in its present form.

30. This final report is, like the interim report, mainly concerned with conditions in Europe and countries with a Western civilisation. If it proved necessary for the Committee to exclude Asia, Africa and tropical countries generally from its detailed studies, this was not due to any belittling of the importance of the question in those areas. On the contrary, the Committee considers that the problem is particularly acute in these parts of the world and calls for urgent attention. But it found from the outset of its work that it would encounter insurmountable difficulties, in present circumstances, in obtaining adequate documentation in the time at its disposal. Moreover, as explained below, the Committee understands that appropriate initial measures are being taken by the Health Organisation with a view to promoting a full consideration of the problem of nutrition in the Far East.

The Governments of these countries or those responsible for their administration are faced with an immense task. Hundreds of millions of persons dwell in these parts of the world. It is notorious that a large proportion of them live in a stage of continual malnutrition; but up to the present very little systematic information on this point has been collected. Studies have, however, recently been initiated. Thus, the Government of the United Kingdom is at the moment pursuing an extensive enquiry into the state of nutrition in the colonial territories under its authority. Moreover, an international Governmental Conference on Rural Hygiene in Eastern Countries will meet in August of this year in Bandoeng (Java) under the auspices of the Health Organisation of the League of Nations. This Conference has adopted nutrition as one of the most important points on its agenda. The League Organisation is thus actively engaged upon the problem of nutrition in Eastern and tropical areas.

31. Within the limits defined in the preceding paragraph, the Mixed Committee has set out in this final report its views on the nutrition problem as a whole, in its health as well as in its economic and agricultural aspects. The physiological side of nutrition, which constitutes the basis of the Mixed Committee's work, had already been dealt with exhaustively in the interim report, but it was felt that the final report should be complete in itself; accordingly, the section of the interim report dealing with nutrition and health has been reproduced with such minor modifications as recent research has made necessary (Part II of the Final Report). In addition, desirous of setting the present movement towards better nutrition in its correct perspective in relation to improvement in public health generally, the Mixed Committee has very briefly summarised the evidence of the remarkable improvement in health conditions which has occurred in certain countries during the past two generations, and has endeavoured to indicate the part which better nutrition has played in this improvement and the part which it may be expected to play in further improvement in the future. (Part I, Chapter 2).

32. In accordance with the instructions of the seventeenth Assembly, however, the bulk of this report deals with the economic and agricultural aspects of the nutrition problem. Believing that Governments, in considering their nutrition policies, would wish to know whether the changes in diet recommended by modern physiology were likely to involve any important break in consumption and production habits, the Committee has devoted a considerable part of this report (Part III, Chapters 1 and 2) to tracing the recent tendencies in food-consumption habits and in agricultural production. It has endeavoured to analyse the factors responsible for the changes observed and has studied the effect of improvements in agricultural methods on food supply, the effect of better feeding on agriculture and the obstacles to agricultural adaptation.

The general conclusions reached are that food habits in Western communities have been tending to change in the right direction, and that not only world agriculture but also the various national agricultural systems should benefit from the increased demand resulting from an extension of the movement towards better nutrition.

The problem of food prices is analysed in Part III, Chapters 3

and 4, where consideration is given to the effect of prices on consumption and to the effect on prices of efficiency of production, commercial and marketing policy and distribution costs. In Chapter 5, the Committee has analysed the rôle of income in determining nutritional levels, and in the next chapter it has devoted its attention to the part which education in the principles of correct nutrition plays and can play in determining food habits.

In Chapter 7, evidence is presented to prove that, in spite of the gradual improvement in nutrition which has been traced in earlier chapters, malnutrition remains to-day a serious threat to health and well-being. The Committee shows that, in countries of the most diverse social structure and general plane of living, appreciable sections of the population are, for one reason or another, failing to secure enough of the foods which the modern science of nutrition regards as essential for health and efficiency.

33. As already indicated, this report is divided into three parts. Part I includes, in addition to this Introduction, the broad outline of trends in public health referred to in paragraph 31 above, and, in Chapter 3, the conclusions reached by the Mixed Committee. This first part is intended to provide, in brief summary form, a statement of League activity in connection with nutrition, an outline of the results of the enquiry conducted by the Mixed Committee, and an account of the conclusions which it reached as a result of its studies and deliberations. Part II contains a revised reproduction of the section of the interim report which dealt with nutrition and health. Part III deals mainly with the agricultural and economic aspects of the problem and with the evidence of malnutrition in a number of countries.

It is believed that this division of the report will prove convenient; the Mixed Committee expresses the hope that those concerned with the formulation and administration of nutrition policy will give careful attention to the detailed analysis contained in Parts II and III as well as to the broad generalisations of Part I.

Chapter 2.

A CENTURY OF PROGRESS IN NUTRITION AND PUBLIC HEALTH.

1. Before proceeding to a full consideration of the problems of nutrition, it may be interesting to examine the part that nutrition has played in the increase in population and general improvement in public health and welfare during the last century or century and a half.

2. Until the latter half of the eighteenth century, the population of Western Europe appears to have remained for many centuries on balance almost stagnant. Periods of normal growth of the population were constantly interrupted by famine and pestilence. Any increase was therefore halting and uncertain. The population of France, for instance, estimated at 20 millions in the thirteenth century, was about the same at the beginning of the eighteenth, although fluctuating widely in the intervening centuries.

3. Towards the end of the eighteenth and beginning of the nineteenth centuries, important changes occurred. In the first place, fluctuations in population were reduced and the trend became definitely upwards. Thus, whereas the population of England and Wales had only increased by some 700,000 in the 110 years preceding 1714, between 1801 and 1901 it increased by 23.6 millions, in spite of large-scale emigration. The population of France, stationary for so long, increased by 11.4 millions, while in Europe as a whole the increase was even more striking. In the hundred years ending in 1900, the population of Europe grew from 187 millions to about 400 millions, to reach probably not far short of 520 millions in 1933.

4. This enormous increase in population was not due to a rise in the birth rate, but to a considerable although gradual decline in the death rate; a marked extension took place in the average span of life of the individual. The expectation of life at birth for

the average German increased between the 1870's and 1924-1926 from 35 years to 56. The Englishman's average length of life increased from 41 to 55.6 years between the 1870's and 1920-1922, and has since increased still further. A similar tendency was to be observed in the other countries of Western civilisation.

5. Not only did population grow rapidly and the average expectation of life rise, but general health and physique improved at the same time. The incidence and fatality of many diseases fell off progressively during the nineteenth century, and there was undoubtedly an increase in stature. In those countries of Northern and Western Europe where conscription has existed since the beginning of the nineteenth century, measurements of hundreds of thousands of young men are taken each year. The average based on these measurements shows a striking though gradual increase. In Sweden, the average stature increased between 1840 and 1926 by over 3 inches (8 cm.). In Denmark, the same increase took place between 1840 and 1913. In Norway, the increase was 4 inches (10 cm.) between 1800 and 1900, and, in the Netherlands, about 5 inches between 1850 and 1907.¹

A similar phenomenon has been observed among both male and female students at American universities.

6. This improvement in vitality and physique was not the result of chance or natural selection. Two main influences appear to have been largely responsible. On the one hand there was a rapid growth of wealth, resulting mainly from advances in scientific knowledge and its application; the consequent technical progress in industry and agriculture, particularly through the introduction of machinery; improvements in transport—roads, canals, railways and steamships; and the development of banking and credit. The national income began to increase much faster than hitherto and the social conditions—housing, clothing, cleanliness, nutrition and education—of the lower-income groups were gradually improved. The developments which accompanied and followed the agricultural and industrial revolutions made available increased supplies of commodities of all kinds and particularly of food. The first chapter of Part III of this report gives statistics showing the

¹ WROCZYNSKI, C.: "Physique and Health", *Bulletin of the Health Organisation*, League of Nations, Vol. VI, No. 3, 1937.

rise in the quantity and variety of foods consumed during recent generations. Fresh fish, meat, fruits and vegetables became available throughout the year and to larger sections of the population. The national diet was supplemented by hitherto rare or unknown foods from distant lands.

7. In addition to this improvement in economic welfare, important advances were made in sanitation and medical knowledge. Even before the development of modern medicine and the new science of bacteriology gave a clearer understanding of the nature and causation of disease, sanitation, personal and public cleanliness and vaccination against smallpox had contributed much towards the reduction of sickness and death rates.

8. There was thus an improvement both on the "positive" side in building up health, physique and resistance against illness generally, and on the "negative" side in controlling and preventing diseases.

We can obtain some idea of the relative importance of the two main groups of factors—the economic and medical—in bringing about the improvement in general health and the resulting decrease in mortality rates during the last hundred years by observing the times at which these changes took place. It is thus important to note that the population increase and decline in the death rate from a number of diseases (especially tuberculosis) had started and got well under way before the new medical and bacteriological discoveries had been made or applied. This suggests that the social and economic progress which had been gradually taking place since the time of the industrial revolution played an important and perhaps dominant rôle. It has been seen that the rise in economic prosperity resulted, in particular, in an improvement in diet, but it was not possible at the time to understand fully the connection between the dietary changes and the decline in mortality.

9. Meanwhile, however, developments were taking place in the science of nutrition which have helped to throw some light on the nature of the relation between diet and health.

For a hundred years after LAVOISIER had first studied man as a machine capable of using the energy of food for his own activities, most attention was fixed on this energy aspect of nutrition. In these years, it was also found that some protein in the food was essential

for growth and existence and that certain mineral and other inorganic elements were also necessary.

In the present century, this quantitative aspect of food was supplemented by discoveries which indicated the great qualitative difference in the natural value of foodstuffs independently of their total protein, fat and carbohydrate content. Thus, proteins were found to differ, those of milk and meat having greater value to the body than the protein of cereals. The discovery of vitamins emphasised this qualitative aspect of dietetics and, in particular, made men realise that food, in addition to supplying the material for energy and growth, held a dominant position in regard to health and disease.

In the first place, it was found that a number of diseases, whose causes were hitherto unknown or merely suspected, were due to dietetic errors. Rickets with its bony deformities, one of the scourges of Western civilisation, and beri-beri, a scourge of the rice-eating communities of the East, were shown to be dietetic in origin and easily preventable. Similarly, it was shown that scurvy, which caused such great losses in merchant ships on long voyages, could also be prevented and cured by the right type of food. The list has been rapidly extended, and it is now known that many common defects in bone structure which render fracture frequent and are not obvious to ordinary examination are due to wrong feeding, especially in infancy and childhood. The structure and regularity of the teeth and the growth of the jaws were found to depend on the diet of early life, and the occurrence of dental decay was evidently correlated with this defective structure. The drain on the pregnant mother of substances in her body during pregnancy and lactation were shown to call for good feeding during these periods in order to maintain her health. It also became apparent that defective feeding often reduced the resistance of individuals to infection, so that the properly fed child or adult might either escape some types of infection altogether or not succumb to the more serious complications that sometimes follow. Thus resistance to many of the serious infections of infancy and childhood, including tuberculosis, was found to be affected by diet. Some defects of the eyes—as, for instance, night-blindness—were also shown to be dietetic in origin and could be easily prevented and cured. Indeed, it became clear that many organs of the body might become defective

in structure and a large number of conditions of ill-health be brought about by diets which hitherto have been regarded as satisfactory. An understanding of these facts made it possible to classify food-stuffs into two main categories: one of foods which are mainly energy giving, such as cereals, fats, sugar, etc.; the other of protective foods rich in vitamins and mineral salts, such as milk, green vegetables, raw fruit, cod-liver oil, etc. An adequacy of both categories of foods was found to be necessary in order to secure optimum health, physique and resistance to disease.

10. Recent observations and experiments have confirmed these important discoveries of the prominent rôle played by nutrition in developing health and physique. The world war afforded a striking demonstration of the effects of a deterioration in diet, when other factors (housing, sanitation, medical knowledge, etc.) were practically unchanged. The general death rate, and especially the death rate from tuberculosis—a still more sensitive index of nutrition conditions—rose in all countries (belligerent and others) where food restrictions were imposed on the population. The greatest rise occurred when and where the restrictions were most severe. The food-producer on the land suffered less than the city dweller, because he could always keep some foodstuffs for his own use. On the other hand, the inmates of prisons, asylums, etc., suffered most because they had no possibility of supplementing the official rations.

In Germany, while the rise in the tuberculosis death rate from 1914 to 1918 was but 23% in the agricultural State of Bavaria, it was as much as 65% in Berlin. In Roubaix and Tourcoing, two industrial towns of occupied Northern France, the rates rose by 101% and 183% respectively.

11. A further illustration is afforded by the effects of war-time food shortage on children. Their special food requirements for growth render children particularly sensitive to dietary deficiencies. Failure to achieve normal growth can easily be measured. This has been done for the school-children of Berlin. Those born and brought up during the war were definitely stunted. Thus, the children born in 1918 who entered school in 1925 were 2 to 2½ inches (6 to 6.5 cm.) smaller and 2 to 3 lb. (1 to 1½ kg.) lighter than those who entered school in 1933. The difference was even

greater for children leaving school (aged 13-14); it was from $2\frac{1}{2}$ to $3\frac{1}{4}$ inches (6 to 8 cm.) in height and from 8 to 12 lb. (4 to 5.5 kg.) in weight. In Leipzig, similarly, the average height of boys increased by $3\frac{1}{2}$ inches (7.5 cm.), that of girls by $4\frac{1}{2}$ inches (10.5 cm.), from 1918 to 1933.

12. Additional evidence has been provided by recent experiments showing the rapid gain in stature and weight of children resulting from the addition to their usual diet of a school meal, or even of a glass of milk daily. Thus, in a boys' home near London, a gain of 7 lb. (more than 3 kg.) in weight and of 2.63 inches (6.7 cm.) in height in a year was recorded for boys who received half a litre (a pint) of milk daily in addition to the ordinary diet; others not receiving the additional milk gained only 3.89 lb. (1.7 kg.) and 1.84 inches (4.7 cm.) during the same period.

The milk therefore accounted for an extra gain of 43% in height and 81% in weight. Similarly, milk given twice daily in Paris to school-children for six months resulted in a 40% extra gain of weight in boys and 65% in girls, as compared with children who had not received additional milk (1.67 kg. against 1.19 kg. in boys; 1.63 against 0.99 kg. in girls).

Many similar experiments might be cited from Japan, New Zealand, Norway, Scotland, the United States of America, etc.

Moreover, the bodily gain was as a rule accompanied by a reduction of minor ailments and infections and by a definite improvement in vitality and in school results.

13. Other striking examples, such as the suppression of beri-beri—a disabling and often fatal illness among the coolies of Malaya—by the mere addition to their usual diet of a cheap vitamin B extract, provided further confirmation of the close relation of food to health.

14. Despite these impressive instances of what can be and has been achieved through positive correction of the diet, it is essential to realise that our knowledge of nutrition and of the other sciences on which public health policy must be based is not static, but is constantly progressing. From time to time, new discoveries are made which may not only add to our knowledge, but may also modify the emphasis to be placed on facts already known. Such discoveries will be studied by the Technical Commissions of the

Health Organisation of the League. As new knowledge is accepted and made known by scientific bodies, it will be part of the function of the National Committees to consider the policies best adapted for its application.

15. Even without further discoveries, however, there is, immense scope for the application of existing knowledge. For instance, the fact that improvements in stature are still taking place in a number of countries and that a large proportion of recruits are still rejected on account of physical defects indicates that, although progress has been real, there is still great room for improvement.

16. Moreover, an examination of vital statistics in various countries shows large differences in mortality rates both as between different countries and between richer and poorer districts in the same country. Thus the death rates in New Zealand and the Netherlands, for instance, are less than one-third of those prevailing in some countries of South America, Africa or Asia; and in some cities, as London, Berlin and Paris, general mortality rates in poor districts are 50 % higher than in the wealthier ones, while tuberculosis mortality is often four times as high in the former as in the latter, and the corresponding proportion of infantile mortality is as 2 to 1.

Similarly, the corrected¹ general mortality rate in a depressed area such as Merthyr Tydfil (South Wales) exceeds that of a well-to-do district such as Epsom and Ewell by 166 %.²

17. There is no doubt that improvement in social conditions, and especially in the feeding of the population in these poorer countries, boroughs and districts, would bring about a considerable increase in health and save many lives.

18. Elsewhere in this report the importance of nutrition in the prevention of disease and in the growth and health of the child and the adolescent has been clearly set out. Here we have shown how nutrition has played its part in the present stage of human

¹ The corrected rate is a rate in which due allowance has been made for variations in the age composition of the population.

² Computed from figures in "The Registrar-General's Statistical Review of England and Wales for the Year 1935", Part I, H.M. Stationery Office, London, 1936.

progress in countries of Western civilisation. From what has been said, it is clear that, if Governments can achieve for their peoples adequate levels of food consumption, further progress, in no way less spectacular than that achieved during the nineteenth century, can be made in increasing the quantity and raising the quality of human life. Not only will national expenditure on hospitals for the treatment of sickness be thereby greatly reduced, but improved health will certainly be accompanied by increased efficiency and a rise in material welfare and happiness. Medical science has already made great strides in the control of disease: in this advance, the science of nutrition has participated, but the application of the "Newer Knowledge" has only just begun. If the hope which nutrition holds out can be transformed into a reality, entirely new perspectives will be opened up for the improvement of human welfare.

Chapter 3.

SUMMARY AND CONCLUSIONS.

A. SUMMARY OF THE REPORT.

1. The problem of nutrition necessarily varies widely from one part of the world to another. In some countries, an adequate diet is probably within the reach of the majority of the population; in others, practically all live but little above bare subsistence level. In some countries, food prices are relatively low; in others, they are high in relation to incomes. The League, through its Health Organisation, is making a special study of conditions in the Far East and certain other regions where the level of national income is generally low. Until these data are available, it is impossible to draw sound conclusions as to the nature of the nutritional problems in the Far East. We have therefore devoted our attention mainly to Europe, the British Dominions, South America and the United States of America.

2. On account of differences in local and national conditions, nutrition policies must vary in different areas. But the ultimate goal must be everywhere the same: to ensure that all sections of the population obtain an adequate diet. By an adequate diet we mean one which includes sufficient of the energy-bearing and protective foods for optimum health.

3. We have tried in the body of our report to show that the tendency towards better nutrition in the countries with which we have dealt is natural and strong; but that the movement is checked and obstructed at certain points, and requires to be directed and accelerated.

4. We have argued ¹ that food habits, at least in many parts of Western communities, have gradually been tending to change in the right direction; and have adduced statistical evidence to show that these communities, on the whole, are now consuming,

¹ See Part III, Chapter 1.

in addition to the indispensable foods of high energy value, more milk and dairy products, more fruit and more vegetables than a generation ago.

5. This improvement in the general level of nutrition has resulted in part from a better understanding of dietary needs, in part from a general increase in income and prosperity and in ease of transport, and in part from improvements in the methods of production and in the distribution of agricultural products. It is impossible to differentiate clearly between the influence of agriculture on demand by the provision of cheaper and higher-quality food and the influence of enhanced demand on agriculture. Where the incentive has originated rather in increased demand, agriculture, as we have endeavoured to show,¹ has, under the influence of remunerative prices, successfully adapted itself. The further changes which we may expect to result from the success of the present movement towards better nutrition must necessarily be gradual, and should, if wisely directed, be of great benefit to agriculture by increasing the demand for almost all classes of agricultural products.

6. The movement towards better nutrition has made considerable progress, but it has not gone nearly far enough. Poverty and ignorance remain formidable obstacles to progress;² the disparity between food prices and incomes³ increases the difficulty experienced by the poorer sections of the community in obtaining an adequate supply of the proper foods. We have shown⁴ that, in countries of the most diverse economic structure and general level of consumption, appreciable sections of the population are, for one reason or another, failing to secure the food which is essential to their health and efficiency. The evidence that has been made available in recent years points to the conclusion that, as a result of insufficient purchasing power, or as a result of the imperfect distribution of resources between food and other objects of expenditure, or through ignorance of food values or carelessness and indifference, or as a result of the maintenance of food prices at levels involving

¹ See Part III, Chapter 2.

² See Part III, Chapters 5 and 6.

³ See Part III, Chapters 3 and 4.

⁴ See Part III, Chapter 7.

hardships to large sections of the community, or other causes, millions of people in all parts of the globe are either suffering from inadequate physical development or from disease due to malnutrition or are living in a state of subnormal health which could be improved if they consumed more or different food. That this situation can exist in a world in which agricultural resources are so abundant and the arts of agriculture have been so improved that supply frequently tends to outstrip effective demand remains an outstanding challenge to constructive statesmanship and international co-operation.

7. The movement towards better nutrition in the past has been largely the result of the unconscious and instinctive groping of men for a better and more abundant life. What is now required is the conscious direction of the natural tendency towards better nutrition. Such direction constitutes policy. Nutrition policy, if it is to be successful, must be directed towards achieving two distinct, though mutually dependent, aims. Its primary concern is with consumption: with bringing the foods which modern physiology has shown to be essential for health and physical development within the reach of all sections of the community. But, in addition, it must also concern itself with supply. Changes in demand involve changes in supply; increased demand, increased supply. Nutrition policy must take into account the necessity for facilitating the adaptation of agriculture and possibly of commerce to changes in demand and of increasing supply as demand expands. We discuss separately these two aspects of nutrition policy in the sections which follow.

B. METHODS OF IMPROVING NUTRITION.

8. Conditions determining food production, distribution and consumption differ too widely to permit of detailed suggestions being put forward for the improvement of nutrition equally appropriate for all countries. We must confine ourselves to enunciating certain general principles and to making specific suggestions of more limited applicability. We have already expressed our views concerning the general principles of policy that should be pursued in the recommendations contained in our interim report. These recommendations were adopted by the seventeenth Assembly and

communicated, on its authority, to all Governments. In the light of our further studies on the problem of nutrition, we desire to reaffirm our belief in the general policy expressed in those recommendations. Such more specific suggestions as we wish to add in the present report cannot, for the reasons we have just indicated, so appropriately be summarised in the form of a series of recommendations. They require to be considered by each nation in the light of the evidence we adduce, and in the setting of the conditions we have described or of the conditions prevailing in each individual State. We hope, however, that the body of our report will be studied by all national authorities, and that the factors affecting nutrition which need further analysis will be considered in the light of national conditions. We further hope that the general principles and the suggestions which we set out in this chapter will be applied in each country.

Recognition of Nutrition as a National Problem.

9. For nutrition policy to be effective, the problem must be recognised as one of primary national importance. During the past half century, standards of sanitation and housing have undergone remarkable changes in certain parts of the world; conditions which are to-day regarded as intolerable were fifty years ago considered normal. These standards are reflected in the greater welfare of the people. The present generation is effecting a similar change in its standards of nutrition. But the importance and future benefits of these new standards of nutrition to health and general well-being are not yet sufficiently widely recognised. It lies with Governments, supported by enlightened public opinion, to take the lead. There is no country in which conditions could not be improved with more Government help and direction; there is no country in which further measures to awaken or stimulate public opinion are not imperatively required. If Governments play their parts in giving a lead to the movement, private agencies may be expected to follow with their distinctive contributions.

National Nutrition Committees.

10. In our interim report, we suggested that a national nutrition policy requires the guidance of some central authority with special

responsibility in order to utilise to the best advantage the teachings of science, interpret them in the light of national conditions and suggest means for their practical application. In making this suggestion, we were especially influenced by the many-sidedness of the problems of nutrition and by the necessity for co-ordinating economic and social action with new physiological teachings.

11. We are now more than ever convinced of the necessity for bringing together scientists, economists, agricultural experts, consumers' representatives, teachers and administrators in National Nutrition Committees. If, as we hope, our own deliberations have been in some degree useful, it is largely due to the fact that the Mixed Committee has grouped together persons of diverse experience who have viewed the problem of nutrition from different angles—whether of health, of labour, agriculture, economics and finance, social welfare, co-operation or administration. It is our firm conviction that through National Committees adequately representative of the various elements that go to constitute this complex problem the most useful progress can be made.

12. One of the most important tasks of National Committees is, in our opinion, to ascertain the prevailing food-consumption habits and nutritional status of all sections of the population. Our own conclusions are based upon sample surveys covering a limited range of families; more accurate and detailed investigations are required. We have been particularly impressed with the scarcity of reliable information regarding the food consumption of rural populations; the paucity of the data has, indeed, prevented us from dealing with the nutritional problems of this important section of the community in sufficient detail. Several National Committees have already taken steps to ascertain facts, quantitative and qualitative, about the diets of their people; and we hope that this will be done elsewhere.

13. A further aspect of the work of National Committees on which we would lay particular stress is the interpretation of the general rules of rational nutrition in the light of national conditions. These general rules are necessarily in terms of calories, proteins, vitamins, minerals, etc. It is an important function of the National Committees to translate these into terms of specific foods, having due regard to the alternative sources from which the different

nutrients can be obtained, the consumption habits of the people, the character of national and local production, the prices of the various foods, etc.

14. Further, the question of the relationship between food prices and incomes, with which we have been able to deal only in very general terms, is clearly one which requires detailed examination in each country, with a view to ascertaining the point at which an equilibrium can be struck between the interests of the consumer, those of the domestic producer and the social and economic structure of the State. These few examples of the type of work which, in our opinion, can be appropriately carried out by National Nutrition Committees will serve to show how useful and extensive can be their activity.

15. We are convinced of the utility and importance of National Nutrition Committees for still another reason. Since our original recommendation in February 1936, such Committees have been established in a considerable number of countries. The representatives of some of these Committees, as well as of some which had been set up earlier, met at Geneva for an informal exchange of views and experiences in February 1937. We have had the advantage of hearing a detailed and interesting report on this meeting, and have been much impressed both by the amount and fruitfulness of the work being done to-day in different countries and by the value of the exchange of views which took place. We venture to recommend later in our report that the League should arrange at suitable intervals for further meetings of representatives of appropriate groups of National Committees in the future.

16. While stressing as strongly as we do the importance of National Nutrition Committees, we are fully conscious of the fact—indeed, we consider it fundamental—that the ultimate responsibility for the nutrition and health policy of a nation must rest with that nation's Government. National Committees, aided where necessary by outside advice, can, however, exercise an important influence on policy, both directly through their influence on Governments and indirectly through their influence on public opinion. For the latter important influence to be operative, it is essential that publicity should be given to their reports and findings and that they should be able to initiate investigations, etc.

17. We have no desire to lay down a doctrine on the constitution and functions of National Committees; these must vary with differences in the administrative practice and traditions of each country. We urge, however, that the Committees be so constituted as to give them a maximum of influence. To this end, it may be suggested that they should be consulted on matters of economic, social and educational policy affecting food consumption, and that they should publish periodic reports on the state of nutrition and the aspects of nutrition policy to which they attach importance.

Education.

18. We have shown in Part III of our report ¹ that food-consumption levels depend primarily upon two factors—the amount of real income at the disposal of the family or individual, and the intelligent use of that income to meet food requirements.

19. Where income is adequate, the problem is one of education; but where resources fall below the limits of reasonable living standards, adequate nutrition cannot be secured even by the most scientific expenditure of those resources. Especially in the present decade, when in Western industrial countries alone millions of idle workers and their dependants are added to the population which, because of social, physical or mental handicap, is more or less permanently dependent on social assistance, the limits of educational efforts must be clearly recognised.

20. We have, however, shown ² that there is some scope for improvement in the dietary habits of even the lower income groups through educational means. Surveys conducted in more than one country have revealed that, in families spending the same amount of money per head on food, some secure adequate diets while others do not. A feature of nutrition policy should therefore invariably be the dissemination of nutritional information among public authorities, voluntary services administering social aid, school-teachers and others in a position to influence food habits. The first step must be to educate those responsible for education and the administration of social aid.

¹ See Part III, Chapters 5 and 6.

² See Part III, Chapter 6.

21. The information thus disseminated should set forth the minimum nutritional needs of different age-groups and should include instruction on alternative sources of the nutritive elements. Efforts should particularly be directed towards impressing upon public assistance authorities the ultimate costliness in ill-health and bad physique of inadequate food allowances.

22. It is further of importance to emphasise the relation of adequate shelter and clothing, fresh air, sunshine, exercise and living conditions generally to the measures of nutrition policy taken to develop the general health of the people. But proper feeding, especially in early life, remains the first objective. We would lay particular stress on the desirability of close co-operation among the agencies interested in nutrition, in health generally, and in the administration of social aid.

23. Through whatever agency it may be disseminated, all nutritional information must be adapted to the habits and resources, not only of each country, but also of the particular groups by whom it is to be utilised in the individual home. The problems of rural populations are widely different from those of industrial workers. Education, if it is to be useful, must be practical, and it must cover all classes of the population—rural and urban, wage-earners and salaried classes. It should include information on alternative diets in terms of actual foods, on the preparation of diversified menus within limited income ranges. It should be devoted to arousing that interest in child and family welfare which, so far as incomes permit, will assure nutritionally adequate food consumption within such homes.

24. Moreover, arrangements should be made to inform all those working in the same field of successful local experiments for supplementing diet. We have in mind, for example, the distribution of certain foods at reduced prices to low-income groups, the organisation of garden allotments and the production or manufacture of foods on co-operative lines.

Income Level and Distribution.

25. Capacity to purchase the foodstuffs needed for adequate nutrition is determined by the size of real income in relation to

the needs of the persons dependent on that income. As we have shown in the body of our report,¹ and as the study² of the International Labour Office has pointed out, what is significant in this connection is not merely the average level of incomes, but also their distribution. Although, for example, the average level of individual incomes in industrialised countries is relatively high, large sections of the population are so poor, owing to the inequality of the distribution of the national income, that they are unable to purchase the requirements of a proper diet. Studies of food consumption at different income levels prove that malnutrition is most prevalent amongst those groups of the population, urban or rural, whose incomes per head are lowest.

26. The lower incomes may rise as a result of their recipients either sharing proportionately in a general increase in the national income or obtaining a greater share in existing or increased totals. Although it is unnecessary to stress the desirability of adding to the total sum of goods and services available for consumption, it is worth recalling that the problem is not solely one of distribution. But at any given moment the possibility of rapid progress by the method of increasing the total resources available is necessarily limited. Measures designed to protect or increase the share at the disposal of the lower-income groups have therefore been adopted in many countries.

27. It is not our intention to examine in any detail the methods which may be adopted to raise the level of incomes in such lower-income groups; but reference may be made to certain general principles that have been widely followed in seeking a solution to this problem. Since incomes in these groups consist in the main of earnings from employment, efforts have been made to safeguard these earnings to the fullest extent. Machinery for the fixing of minimum wages and legislation providing for the full and regular payment of the wages fixed or agreed on have, where adopted, performed an important function in securing to wage-earners an adequate living. For those whose incomes from employment are interrupted, whether as a result of illness or accident, or in consequence of involuntary unemployment, systems of social insurance

¹ See Part III, Chapter 5.

² "Workers' Nutrition and Social Policy", pages 114 *ff.*

have been adopted in many countries. Family allowances or other supplementary measures have improved the position of large families which, as we have shown,¹ are in particular danger of malnutrition. Where such systems are lacking or have proved inadequate, Governments have in recent years afforded direct relief in various forms, especially to the unemployed. Were it not for such measures, the nutritional state of large sections of the populations of industrial States would be even more seriously defective than it is to-day. We desire therefore to emphasise the great importance of the extension of such social legislation for the protection and improvement of the health of the people.

Social Provision.

28. But the problem of malnutrition is urgent. Each generation begets its successor and passes on its heritage of disease and structural malformation. Sufficient security against the risks of malnutrition is not achieved in any country. For this reason, many Governments—and, indeed, precisely those Governments which have done most to promote social legislation—have adopted measures of direct assistance in order to supplement the diets of the more exposed sections of the community.

29. Such measures have been very properly directed especially to preventing malnutrition in childhood. The damage done by faulty feeding in the pre-natal period, in childhood and in adolescence cannot be repaired later in life. In our interim report, we stated that the health of the child was the kernel of the problem; we reiterate and emphasise this view.

30. We strongly urge, therefore, that the efforts already being made to improve nutrition by public and private health and welfare authorities in maternity and child-welfare centres, in schools and elsewhere should be encouraged and strengthened by all possible means.

31. Of special importance is the adequate consumption of milk by infants, children, adolescents and expectant and nursing mothers. At several points of our report we have referred to the high nutritive

¹ See Part III, Chapter 5.

properties of this food. Its value is unique; it is indispensable; more than any other food it contains the elements essential for life and growth. It has no satisfactory substitute and it is in itself the nearest approach we possess to a complete food. In our opinion, one of the most important immediate practical steps that can be taken, and has in certain cases already been taken, by Governments to raise the standard of health of the growing generation is to arrange for the free or cheap distribution of safe milk to children of school and pre-school age. The danger of malnutrition exists for children of most income-groups. We have shown¹ that, where there are many children in the family, the milk consumption per head tends to be low, even when the family income, and income per head, is relatively high. These facts should be borne in mind when schemes for the social provision of milk for school-children, or for initiating an educational campaign, are under consideration.

32. We refer below to the important part which school meals play in nutrition in childhood. Here we wish to point out that schemes of social provision have been directed, not only to ensuring that the nutritional requirements of children should be more adequately covered, but have, in certain cases, also taken account of the regular need for the addition of protective or other foods to the diet of certain particularly exposed sections of the adult community. In addition to such permanent provision, we would draw attention to the measures adopted in certain countries for the distribution to necessitous families of surplus supplies of food products.

School Meals.

33. We have already, in our interim report, referred to the importance of adequate nutrition during the school years as well as in early childhood. We pointed out that, while compulsory education had been generally adopted throughout the civilised world, large numbers of school-children were not mentally or physically capable of profiting by it. We therefore put the question whether, as a corollary to the provision of educational

¹ See Part III, Chapter 5.

facilities, steps should not also be taken to ensure that the nutritional needs of such children were fully satisfied, so that they would be more physically and mentally fitted to benefit from the opportunities afforded them.

34. Conditions affecting the nutrition of school-children differ so widely from one part of the world to another that it is not possible to make detailed recommendations of general application. We wish, however, to draw special attention to the fact that in several countries the diet of school-children is being supplemented by the regular provision of free or cheap meals at schools. The "Oslo breakfast" ¹ is a well-known example: this meal consists of uncooked protective foods and is served to the children before the day's work. The cost of this form of supplementary feeding for children is relatively low, and the results appear to be very satisfactory. We are of opinion that, in countries and communities where action by the central or local authorities appears to be called for, careful consideration should be given to this method of improving the nutrition of school-children. Wherever meals are provided for children at school, we wish to emphasise the importance of their being prepared in accordance with the most recent teachings of nutritional science.

35. Our attention has been drawn to the fact that, even in certain countries where most progress has been made in spreading knowledge of the correct principles of nutrition, the meals regularly provided to children attending private boarding-school are sometimes seriously defective: in some instances, milk and fresh fruit are not included (or only in quite inadequate amounts) as part of the ordinary dietary, but are treated as "extras" for which supplementary payment is required.

We believe that, in boarding-schools and similar institutions, the findings of modern science should be used in determining the diets and, that where this has not already been done, careful enquiry should be made into the adequacy of the diet at present given in such institutions.

¹ This consists of milk, bread or biscuits, butter and raw fruit or vegetables. It has the important advantage of requiring no cooking or preparation at the school.

Dietary Policies in Public and Private Provision of Food Needs.

36. Every modern State is directly responsible for the feeding of large numbers of people, whether in schools, in hospitals, in charitable and benevolent institutions, in relief centres, or in various State services, such as the army and navy. Moreover, there is a growing tendency for private industries to develop canteens and restaurants where the workers take or supplement their midday meal. We hope that, where public and private authorities are responsible for the provision of meals, they will ensure that diets adequate in all nutrient constituents are provided.

* * *

37. We have up to this point concentrated our attention on the consumption side of the nutrition question. We must now turn to production and distribution. Questions of food supply and price are important from two points of view: first, from the point of view of the producer of food, whose standard of living is largely dependent on the prices he obtains; and, second, from the point of view of the purchaser of food, whose purchasing power is dependent on the ratio of food (and other) prices to money income. It is convenient to consider these two aspects of the problem jointly in the next section.

C. THE ADAPTATION OF AGRICULTURE.

38. Improved nutrition must immediately or in a short lapse of time prove of general benefit to agriculture and fishing. Better nutrition means an increase in the demand for foodstuffs; and an increase in the demand for foodstuffs implies greater agricultural activity. Certain adjustments in agricultural production will no doubt be required; adjustments are always required whenever social progress occurs. It would, however, be a mistake to exaggerate the magnitude of these adjustments. The change in dietary habits to which we look forward will be steady and gradual: it will not occur in a day. Moreover, the majority of the protective foodstuffs (milk, vegetables, etc.) are of a perishable character, so

that they must necessarily be produced not far from their place of consumption. As these foods come to play a more prominent part in national diets, therefore, their production will offer a natural stimulus and protection to domestic agriculture. But the energy-bearing foods still remain, and will remain, the basis of the diet: they play an essential rôle in human nutrition. We have dealt in this report only with European and certain other countries of Western civilisation. If the inadequacy of the diet of the lower-income groups in these countries, even as regards energy-bearing foods, be considered, it is clear that an improvement in the nutrition of these classes should benefit the arable farmer; if the world problem of nutrition be viewed as a whole, the enormous scope for increase in the consumption and production of cereals and certain other foodstuffs valued chiefly for their energy-yielding qualities becomes at once apparent.

While national agricultural systems will thus benefit by the growth in the demand particularly for the more perishable protective foods, countries producing for export will benefit, as the primary needs of the poorer classes for energy-producing and less perishable protective foods are more adequately satisfied.

39. We have argued¹ that agriculture has adapted itself successfully—albeit not without some difficulty—during the past twenty-five years to changes in the structure of demand, in particular where increased demand has expressed itself in higher prices. The adaptation required in the future will not involve a rapid transformation of the whole structure of agricultural systems, but merely the gradual change in and expansion of production to meet the new requirements. Policy must be directed towards helping the orderly expansion of agriculture and its adaptation to the changing demand.

40. All adaptation and expansion, whether in industry and commerce or in agriculture, requires capital; but in most countries industry and commerce have far readier access to capital to assist them in their adjustments than has agriculture. In considering the agricultural aspects of the nutrition problem, we desire, therefore,

¹ See Part III, Chapter 2.

to emphasise at the outset the need for an improvement in agricultural credit. We have not been able to make an exhaustive study of the questions of agricultural assurance and credit. The question of long-term agricultural credit is one which the Financial Organisation of the League has already considered, and to which the Financial Committee has reverted in its last report. Furthermore, the International Institute of Agriculture has concerned itself in the past, and will, we understand, concern itself still further in the future, with the problem of agricultural indebtedness, insurance and credit, especially medium- and short-term credit. We hope that the appropriate national authorities will, in framing their general nutrition policy, give weight to the necessity for developing agricultural credit institutions in countries where adequate machinery does not already exist.

41. We also attach great importance to the encouragement and development of agricultural co-operation. The services which co-operation has rendered to producers and consumers alike are well known. Adjustments which are difficult for an individual producer may be facilitated by the joint action of many producers. Improvements in methods, the joint use of machinery, access to scientific knowledge, information regarding market conditions, the rational organisation of marketing—these are only a few of the benefits which have been derived from agricultural co-operative societies. These organisations should be strengthened and developed in countries where they already exist and established in countries where they do not exist.

42. The State and agricultural organisations can help the adaptation of agriculture through the education of farmers. We have in mind not only the spread of knowledge about agricultural methods and processes—an important element to which we refer below—but also the dissemination of information regarding the general trends in the demand for foods which are likely to result from better nutrition. By educating agriculturists to the importance of increasing, where possible, their output of protective foods, the State can contribute at once to an improvement in agriculture itself (through, for example, the enriching effect of animal husbandry on the soil) and to an improvement in nutrition. We are also convinced of the necessity for teaching farmers, so

far as soil and climate allow, to grow more of the protective foods for their own use.

43. The adaptation of agriculture to changed requirements can, however, be impeded as well as facilitated by State action. Thus tariffs and other forms of trade restriction may, if excessive, so affect prices as to draw farmers into the production of foods for which demand is shrinking and consequently prevent them from expanding their production of foods the consumption of which it would be desirable to increase. Subsidies to consumption, on the other hand, may provide equally valuable assistance to agriculture and at the same time serve to promote, rather than impede, the necessary adjustments. Protection to the farmer can often be given most effectively, and without prejudice to nutritional standards, by improving methods of agricultural production and distribution—by keeping the farmer currently informed of the latest discoveries of science and of market developments, by combating animal disease, by facilitating the purchase of better seed, by watching over fodder and fertiliser prices, by improving transport facilities, by strengthening the agricultural credit system, and by stimulating national consumption. Improvements in agricultural methods result in high yields per acre, while measures of artificial stimulation frequently bring under cultivation inferior land and may result in lower yields.

44. An effective method by which Governments or private bodies may encourage improved efficiency in agriculture is through the development of schemes for recording output. The value of such schemes may be enhanced by combining them with local or national competitions, which serve to arouse the interest of individual farmers and result in a rapid spread of information regarding new and successful technical methods and in their early and general application.

45. In view of the importance attached by nutritional experts to an increased consumption of fish and fish-liver oils, the development and preservation of sea fisheries by national and international action would constitute a valuable contribution to nutrition policy.

46. The orientation which should be given to commercial policy in the light of nutritional requirements is a very complex problem. Many interests are involved, and the most careful analysis

and study are required before action can be taken. We have tried to throw some light on the problem in our remarks on the elasticity of demand.¹ It should be clearly understood that the demand for protective foods cannot be greatly increased if the price of the energy-bearing foods is high in relation to incomes. Indeed, the demand for high-quality protective foods may, in such circumstances, be considerably increased by reducing the prices of the energy-producing foods. This problem requires most careful study in each country, for the solution which is correct in, for instance, a rich country or one where natural conditions favour diversified farming may well be wrong for a poor country or where natural conditions are unfavourable.

47. If steps are taken to facilitate changes in agricultural production, European as well as non-European agriculture will derive great benefit from the movement towards better nutrition. Not the least of these benefits will be the improvement in the nutrition of the agriculturist himself. We have reported² on the paradoxical fact that the producer of food in Europe is not seldom badly nourished. In certain countries, this must be ascribed in part to the fact that he has been encouraged to concentrate his productive resources on one or two crops. Now, better nutrition always means more diversified nutrition. This diversification of demand implies a reciprocal diversification of agriculture, especially more dairy and fruit farming and more vegetable-growing. Under the technical conditions of cultivation which prevail in Europe, diversification is likely in many cases, though not of course always, to affect the individual farm as well as national agricultural systems. In short, as the movement towards better nutrition spreads and grows, individual agriculturists will be encouraged to produce more of the valuable foods mentioned above, and their own state of nutrition will in consequence rise. In this connection, we may repeat that we attach special importance to the education of the small farmer to the nutritive value of dairy produce, vegetables and fruits, so that, whilst directing his chief efforts to production for sale, he will at the same time realise the importance

¹ See Part III, Chapter 3.

² See Part III, Chapter 7.

of providing, where conditions allow, foods of high nutritive value for consumption in his own household.

Food Supplies and Food Prices.

48. Farmers and consumers alike frequently complain of the wide discrepancy between the selling price of foodstuffs at the farm and their price at retail. This margin is composed of transport and distribution costs and taxes. It is clearly not possible for us to form an opinion concerning the justification of the complaints to which we have referred; but we would draw attention to the fact that certain authorities have been able to reduce the margin of cost as a result of the careful scrutiny of its component parts and the adoption of appropriate measures whenever the cost of transport and distribution proved excessive.¹

49. In view of the perishable nature of many protective foodstuffs, special attention has been paid in certain countries—rightly, in our opinion—to improving refrigeration and storage facilities and to the organisation of quick and adequate transport at low rates.

50. At the retail stage of distribution, the problem of margins is particularly complicated and difficult to analyse. In many countries, special committees have from time to time been set up to investigate it; but their findings have more often than not been inconclusive. It is, indeed, difficult to assess the cost or value of the services with which some retailers of food provide their customers—cleanliness, variety, attractiveness of presentation, credit, delivery. There are grounds for believing, however, that the volume of turnover might be increased in certain areas, were the retail margin per unit reduced, without any loss of profit to the retailer.

51. In many countries, the consumers' co-operative movement has resulted in an appreciable reduction in margins, both to its own customers and—through its competition—to those of private retail establishments. Elsewhere non-credit shops, where the

¹ See Part III, Chapters 2 and 4.

consumer does not pay for delivery which he does not require, nor for bad debts incurred by retailers on sales to their customers, have resulted in lower prices. In most countries on the Continent of Europe, special markets, where the grower of fruit or vegetables keeps his own stall, help to eliminate or reduce both overhead costs and excessive middlemen's profits.

52. A major factor affecting the prices of foodstuffs to the consumer in some industrial States is constituted by taxes on imports. Such taxes are imposed in most countries mainly to protect agriculture—revenue taxes with their corresponding excise being generally limited in number. It is for each Government to weigh for itself the claims of agriculture for protection and of the consumer for cheap food. It is not sufficient that the food supplied should be normally plentiful; its supply must also be assured. The problem of agricultural commercial policy is thus one of considerable complexity.

53. We have given in the body of our report¹ examples of comparative prices of certain foodstuffs in different countries. After all allowance is made for differences in local qualities, no one can study these tables without being struck by the very wide discrepancy in prices that exists to-day even between neighbouring States. Governments of all countries with disproportionately high prices of any valuable food should, we suggest, consider very carefully whether there are imperative reasons for depriving large sections of the community, whether they be wage-earners or others with relatively low incomes, of the advantages of cheap food which are enjoyed by other countries.

54. While each country must decide on its own commercial policy, there is one principle the universal acceptance of which we would urge—namely, that adequate nutrition be one of the factors determining such policy. The advice of nutrition and social-economic experts should, in our opinion, be sought whenever a question of agricultural or commercial policy arises. The National Nutrition Committees which we have recommended would appear to provide a useful channel through which this advice might be obtained.

¹ See Part III, Chapter 4.

D. FUTURE WORK OF THE LEAGUE OF NATIONS IN NUTRITION.

55. During the months which have elapsed since the Assembly of the League of Nations decided, in September 1935, to appoint a Committee to submit a general report "on the whole question of nutrition, in its health and economic aspects", there have been a remarkable growth of public interest in nutrition and a greatly increased realisation of its importance.

56. The problem of nutrition is, indeed, eminently suitable for international collaboration and consultation. As, however, conditions vary so radically in different parts of the world, collaboration might well at the present stage take place within continental or regional groups, where the problems are similar. For this reason, we are pleased to be able to state that the Health Organisation of the League of Nations has convened for August 1937 an Inter-Governmental Conference on Rural Hygiene in Far-Eastern Countries at which a special commission on nutrition, including some of the foremost experts of Asiatic countries, will be constituted. We are also glad to note that the seventeenth Assembly of the League of Nations decided on the convocation of an Inter-Governmental Conference on Rural Hygiene in Latin-American Countries, at which, we understand, nutrition questions will be discussed.

57. In addition to preparing these consultations, the Health Organisation will, as we have observed in the introductory chapter, continue its useful work of acting as an international clearing-house of information on nutritional questions. Moreover, having already laid down an agreed international scale of the calorie requirements of the two sexes at different ages of life, it is now proceeding to consultations with a view to setting up international standards of requirements of vitamins, minerals and other nutrients. It will also conduct and stimulate research along other important lines.

58. We have been informed also that, in accordance with the wish expressed by the Fifth Committee of the seventeenth Assembly, the League of Nations Advisory Committee on Social Questions plans, in collaboration with other competent bodies, to

pay special attention to the social aspects of malnutrition among children (whether or not cared for in their own families) in both urban and rural areas. We welcome this further evidence that the League will continue and extend its activity in this field.

59. At our first meeting, we recommended the creation of National Nutrition Committees to originate and co-ordinate policy in this field. As a result, committees have been set up in several countries and we have been informed that they are in process of being established in others. A first meeting of the representatives of some of these committees was held under the auspices of the League of Nations early this year. As we have already stated, the exchange of views which took place was particularly fruitful. Those participating acquired information regarding the methods of nutritional investigation and education used in other countries which, in their opinion, will prove to be of great service to them in dealing with their own national problems. It therefore appears to us desirable that periodic meetings should be held, under the auspices of the League of Nations, of the representatives of the committees of countries whose nutrition problems are broadly similar in character.

60. We have already referred¹ to the contribution which the competent international organisations can make and are making to the study of various aspects of the nutrition problem; there is, in our view, scope for further fruitful collaboration between these organisations and the National Nutrition Committees. We desire here to draw attention to a few additional possibilities of effective collaboration. The first relates to the methods used in ascertaining the food-consumption habits of the various populations; we attach great importance to the improvement of these methods and to the securing of a higher degree of international uniformity.² The second relates to the collection of other data required by the National Nutrition Committees in order to develop a national nutrition policy. Such a policy must be based, not on generalities, but on specific foods, and must take account of the food-consumption

¹ See Chapter I, paragraphs 8, 10, 11, 19 to 24, 25, 26, 27, and also paragraphs 40, 54, 55 and 56 above.

² See Chapter I, paragraph 18.

habits and economic resources of the various peoples; it requires abundant information regarding, not only existing food-consumption habits, but also the nutritive values of different foods, nutritional requirements and food prices. It is our view that the competent organs of the League of Nations, in collaboration with the International Labour Office and the International Institute of Agriculture, could make a valuable contribution to the task of the National Committees by informing them of the methods successfully employed in the collection and analysis of this information. Finally, we would express the hope that, if the National Nutrition Committees publish periodic surveys of nutrition policy in their respective countries, the competent organs of the League of Nations will, from time to time, incorporate the information contained in these reports and other pertinent material from the several countries in a review designed to show the progress of nutrition policy in the various parts of the world.

* * *

In presenting this final report on the economic and agricultural aspects of the nutrition problem, we have discharged the duty laid upon us by the sixteenth and seventeenth Assemblies.

We have not attempted to provide ready-made solutions for a problem which is infinitely complex. As a result of our studies and discussions, we have been able to submit certain general principles for the consideration of Governments. The facts that we have adduced in this, our final report, confirm and, we venture to believe, substantiate the recommendations we put forward in our interim report; these recommendations are annexed hereto.

The malnutrition which exists in all countries is at once a challenge and an opportunity: a challenge to men's consciences and an opportunity to eradicate a social evil by methods which will increase economic prosperity.

* * *

RECOMMENDATIONS PUT FORWARD BY THE MIXED COMMITTEE
ON THE PROBLEM OF NUTRITION IN ITS INTERIM REPORT.

The Mixed Committee, while recognising the importance of the economic aspects of the nutrition problem, the fuller treatment of which it desires to reserve for a later report, submits to the Assembly the following preliminary recommendations, in the hope that, if they are approved by the Assembly and accepted by Governments, they will make a real contribution to the improvement of nutrition.

In order to promote endeavours to secure an adequate provision for all their people of necessary and, more especially, of protective foods, the Mixed Committee suggests to the Assembly to recommend that Governments should:

(1) Encourage and support in every possible way the further scientific study of nutrition problems with a view to ascertaining the optimum nutrition for each country, due consideration being given to differences of national economic structure, of climate and of available sources of supply;

(2) Take all appropriate measures to ensure that the latest information about nutrition is included in the teaching of medical students and that medical practitioners, medical officers of health, district nurses, etc., have such information constantly brought to their notice;

(3) Conduct a vigorous policy of education on popular nutrition for the instruction of the general public in this subject;

(4) Support the Health Organisation of the League of Nations, not only in the work of its technical committees, but also in its endeavours in the field of public health and preventive medicine to promote the application of modern nutritional science for the benefit of the different age and occupational groups of the population;

(5) Facilitate and promote international co-operation in education and propaganda and in the exchange of information, and, in particular, encourage all appropriate international organisations to lend their help;

(6) Consider what steps should be taken, whether at the public charge or otherwise, to meet the nutritional needs of the lower-income sections of the community, and, in particular, the means by which they might ensure that adequate supply of food, especially safe milk, should be made available for expectant and nursing mothers, infants, children and adolescents;

(7) Consider what further steps might be taken to meet the nutritional needs of adults, unemployed or otherwise in distress.

(8) With a view to giving the fullest possible effect to national propaganda and educational efforts for the improvement of popular nutrition:

Take all possible steps to make food supplies, and especially protective foods, so far as possible, available at prices within the reach of all classes of the community, while at the same time safeguarding the interests of the producers;

Take steps to improve and cheapen the marketing and distribution of foodstuffs in both industrial and rural districts, and, with these objects in view:

Encourage collaboration between co-operative and other forms of producers' and consumers' organisations;

(9) With a view to assuring purity of food and in the interest of public health, promote, so far as possible, the international unification of the technical analysis and control of foodstuffs, and of the control of preparations sold primarily for their vitamin content on the basis of the work being conducted on standardisation of biological products;

(10) Set up standards of reference and specifications for grading foods of all kinds according to quality;

(11) Consider whether any modification of their general economic and commercial policy is desirable in order to ensure adequate supplies of foodstuffs, and, in particular, to assist the reorientation of agricultural production necessary to satisfy the requirements of sound nutrition;

(12) Co-ordinate the work done by different authorities which affects the nutrition of the people and, in the absence of a central

authority, set up a special body for this purpose, in order to secure unity of policy and direction;

(13) In order, *inter alia*, to ascertain how far existing national dietaries fall short of the new standards of nutrition, collect information on food consumption by families of different occupational groups at different income levels as well as on the distribution of the population by family income;

(14) Consider to what extent and by what means their national statistics of the supply and consumption of individual foods might be improved;

(15) Assist the International Institute of Agriculture in collecting information regarding supply, national consumption and prices of foodstuffs.

* * *

Furthermore, the Mixed Committee invites the Assembly to recommend the Governments concerned to give their full support to the Health Organisation in its enquiries into the widespread malnutrition which exists in the tropics and certain Far-Eastern countries.

PART II.

Nutrition and Health.

NUTRITION AND HEALTH.

I. INTRODUCTION.

The progress made in medical science and hygiene in the second half of the nineteenth century led Governments to the realisation that great possibilities of improvement in national health were within the reach of mankind. The knowledge of the infective nature of many maladies indicated ways of stamping out epidemic disease. Means were discovered of making the human environment more healthy and of fortifying the body by physical training, which became increasingly popular. It was confidently hoped that the ancient ideal of *mens sana in corpore sano* would become the heritage of all human beings if the work thus begun was pursued further with devotion and enthusiasm.

But this very work has revealed the extent of the ills which it has to cure. In spite of the application of the knowledge of medicine and hygiene, the physical condition of a large part of the human race is still far below the accepted standard, and the more recent advances in medical science have established the fact that this inferiority is largely due to imperfect nutrition.

In the great war, nations which were obliged to enroll large numbers of very young soldiers were appalled at the poor quality of the recruits that were presented for service. Medical inspection of schools revealed then and still reveals a large number of sickly children below the normal standard of development for their age. The considerable decline in infant mortality in some countries only renders more impressive the persistence of high

infant mortality in others. Certain epidemics display a destructive power that seems due, not solely to the virulence of the infective agent, but also to a lack of resistance in the population attacked.

At the same time, the discoveries of the last thirty years leading to the "newer knowledge of nutrition" show with ever-increasing certainty that inadequate nutrition plays an important part in infant mortality and can account for the excessive proportion of under-developed school-children and adolescents and the poor health and small output of a large number of workers. Deficiencies in diet and diseases of nutritional origin can be observed, not only among urban populations, but also among dwellers in country districts, and not only in poor or primitive countries, but also in the rich nations with an old and highly developed civilisation.

Interest having thus been awakened as to the importance of correct nutrition for the public health, investigation of the existing conditions has spread to every quarter of the globe, the results of which have created the suspicion that a large part of humanity may be ill-fed or underfed.

2. THE PRINCIPLES OF CORRECT NUTRITION.

The diet must supply the necessary substances for the growth and repair of the organism and energy for the production of animal heat and muscular work. The organism being in some respects comparable to a heat-machine which converts fuel into calories, its energy requirements may be estimated in calories. The fuel or energy needs of the body are supplied by the fats, carbohydrates and proteins of the diet, the proteins having the additional function of building new tissue for the growing animal and of repairing tissue wastage in the adult. For these purposes, the proteins contained in animal foods are of better *quality* than those contained in foods of plant origin, the proteins of milk, eggs and glandular animal tissues (liver, kidney) being specially valuable. Foodstuffs rich in animal protein have sometimes been called body-building foods. The diet should contain a certain proportion of foods providing "good" protein, and it is usually held that about 50% of the protein in a diet should be of animal origin.

Recent nutritional research has stressed the great importance of other essential food elements, vitamins and minerals, which are also indispensable, though required in relatively small quantities.

Vitamins.

The vitamins, of which about ten have been differentiated, have been called food hormones,¹ the conception being that, in the economy of the body, they direct the correct utilisation of the other dietary elements. A long list of diseases, including rickets, osteomalacia,² beri-beri, pellagra, dental caries, scurvy, ophthalmia, are now known to be of nutritional origin and to be caused partly or wholly by deficiency of one or more of the vitamins. The vitamins have been extensively studied in the last twenty years, some have been isolated in the pure state, while, of the nature and function of others, knowledge is still very imperfect. The principal vitamins, all of which are necessary to promote growth and maintain health, have been classified as follows :

Vitamin A (fat-soluble). — Deficiency of vitamin A is manifested by impairment of vision, which, in a severe form, results in night blindness, and not infrequently in corneal ulcer, leading to blindness. Populations receiving inadequate vitamin A have a high incidence of kidney stones, bronchitis and other lung diseases, and impairment of function of the intestinal tract.

Vitamin B Complex (water-soluble). — Two components of this complex have been isolated from natural foods, and chemical studies have resulted in their synthesis. These are vitamin B₁ and lactoflavin.

Vitamin B₁ deficiency is the cause of beri-beri, which, among rice-eating peoples, constitutes a major health problem. The primary injury is to the nervous system. This vitamin is now being synthesised in a number of countries. It is noteworthy that physicians are reporting favourable response by many patients who suffer from poor appetite and neuritis following administration of this vitamin. This suggests that

¹ From a Greek word meaning "messenger". Hormones are thus chemical messengers.

² Osteomalacia is a disease in which the bones of adults become largely composed of osteoid tissue which contains very little calcium and is therefore soft. Great deformity of these bones may result.

even in a country with ample food resources, faulty selection of food may result in this specific form of malnutrition. There is strong evidence that human dietaries in many parts of the world are more or less deficient in vitamin B₁, although beri-beri is absent.

Lactoflavin is the greenish-yellow pigment in whey, and was first prepared in pure form from whey. It occurs in liver, kidney, yeast and in many yellow vegetable products. It has been synthesised in the laboratory. Lactoflavin is the chemical name for vitamin B₂. It is an indispensable nutrient since animals deprived of it sicken and die. The study of the effects of a deficiency of this substance has not progressed far enough to reveal much information concerning the nature of the physiological damage which occurs through its privation.

The remaining components of the B complex at present unidentified are concerned with the prevention of pellagra, and possibly sprue¹ and acrodynia,² and certain forms of anæmia.

Vitamin C (water-soluble). — This is necessary for prevention of scurvy. Although scurvy is now relatively rare, it is evident that sub-clinical scurvy is relatively common. The health of the blood vessels is greatly dependent upon an adequate supply of vitamin C, as are also the structures in the pulp cavity of the living tooth. It is shown that animals which have been somewhat depleted of their reserves of vitamin C, but not sufficiently to induce scurvy, are much more sensitive to injury by bacterial poisons produced during infections, than are animals whose body store of the vitamin is ample. Doses of bacterial poisons which are tolerated with impunity by animals with adequate reserves of vitamin C, cause injury to the arteries of animals with no reserves of this substance. Increased susceptibility to certain infections is also caused by depletion of the store of the vitamin in the tissues. It is used up much more rapidly during fever, as in tuberculosis, than under normal conditions of health. Every year, new

¹ Sprue is a disease associated with gastro-intestinal disorder, and is generally accompanied by anæmia.

² Acrodynia is a disease characterised by pricking pains and other disturbances of secretion in the palm a of the hands and soles of the feet, associated with reddening of the skin.

evidence comes to light showing the importance of taking daily an adequate amount of vitamin C as a measure for safeguarding the health.

Vitamin D (fat-soluble). — This is required for correct utilisation of calcium salts and phosphates in the nutrition of the growing and adult skeleton, for prevention of rickets, osteomalacia¹ and dental disease. Vitamin D can be taken in the food (in egg-yolk or fish or liver oils) and is also synthesised in the skin by the action of certain of the sun's rays which, in temperate regions, are present only in summer, but are abundant and powerful in their action in tropical and Southern-European countries.

The nutritional diseases mentioned above are, except in the case of rickets, the outcome of long-continued severe deprivation of the vitamins in question. It is perhaps even more important to emphasise, however, that a less severe deprivation in time or extent or a partially inadequate intake of these essentials may involve ill-defined and disabling departures from health of which the causes may remain undiagnosed.

Minerals.

Recent researches have revealed the great importance of an adequate amount, and a correct balance, of essential minerals in the diet. Of these, calcium, phosphorus, iron and iodine have a special interest. Since a large proportion of the human body is composed of calcium phosphate, forming the skeleton and teeth, the need for ample supplies of calcium and phosphorus is self-evident. A smaller but necessary supply of iron is required for nutrition of blood elements and prevention of anæmia, and a minute provision of iodine is also necessary for the prevention of simple goitre or increase in size of the thyroid gland.

3. "ENERGY-BEARING" AND "PROTECTIVE" FOODS.

A useful division of foods into two classes has been made —(1) the protective foods, those chiefly valuable for providing minerals, vitamins and "good" protein, and (2) the non-

¹ See footnote, page 61.

NUTRITIVE VALUE OF FOODS.

Food	“ Good ” protein	Minerals	Vitamins			
			A	B	C	D
Milk	++	+++	+	+	∅	∅
Cheese	++	++	+	+	—	—
E Eggs.	++	++	+	++	—	++
E Liver	++	++	+	++	—	+
E Fat fish (herrings, etc.)	+		+	+	—	++
Green vegetables, salads	+	+++	+	+	++	—
Raw fruit, fruit juices		+++	+ *	+	++	—
E Butter	—	—	+	—	—	+ ∅
Cod-liver oil	—	—	+++	—	—	+++
Yeast	+	+	—	++	—	—
Meat (muscle) . . .	+	⊥	—	+	⊥	—
Root vegetables, tubers			+ *	+	+	—
Legumes (dry peas, lentils)			—	+	—	—
E Cereals, bread (whole- meal)	+	⊥	⊥	+	—	—
E Cereals, bread (white)			—	—	—	—
E Cereals, rice (polished)			—	—	—	—
E Nuts	⊥		—	++	—	—
E Sugar, jam, honey. .			—	—	—	—
E Margarine, olive oil and other vegetable oils			—	—	—	—

Highly
protective
foods

Less
protective
foods

Non-
protective
foods

E = foods of high energy or caloric value.

+++ signifies very rich.

++ signifies rich.

+ signifies present.

⊥ signifies present in small amount or traces.

— signifies absent.

∅ signifies in summer, when the cows are on pasture.

* signifies if yellow in colour.

protective foods, chiefly valuable as energy-providers. Lack of calories causes starvation, lack of protective foods causes various "deficiency" diseases which may develop in spite of an abundant calorie intake.

The table given opposite contains a rough classification of some of the commoner types of foods into these two classes and shows their relative value as vehicles of energy, good protein, minerals and the more important vitamins.

Among the most important protective foods are the dairy products, especially milk. Then the glandular animal tissues (*e.g.*, liver) and eggs; "fat" fish, green vegetables and fresh fruit are also very rich in vitamins and minerals. Finally, there are certain fats (butter and cod-liver oil) of special value for providing vitamins A and D. Vitamin D, which is sparsely distributed in ordinary foodstuffs, is a vital necessity for young children living in temperate climates or in industrial regions where sunlight is scarce, especially in winter.

Among the prominent energy-giving foods are the fats, the cereals and sugar. The ordinary mixed diet should form a collection of protective and non-protective foods supplying the requisite energy for the body's activity and containing all the necessary protective elements in a correct balance. An unlimited number of different diets could be composed, all of which would satisfy this nutritional ideal. According to the variation in the food supply in different climates and under different circumstances, so the problems of correct nutrition will in practice be met by a large variety of different food combinations. The *principles* of correct nutrition, however, remain the same.

4. SPECIAL DIETARY NEEDS OF DIFFERENT CLASSES AND AGE-GROUPS.

Study of the incidence of nutritional disease has demonstrated the general principle that, where a specific dietary deficiency exists, evidence of its effects will be first apparent in those individuals who are subjected to special physical strain.

If the protective elements are adequate in a diet, the needs for support of extra manual work can easily be met by additional non-protective foods, such as fats and carbohydrates, from which

the additional energy can be obtained. Where the supply of protective elements is inadequate, physical strain will often make the defect manifest. Thus, in the history of arctic exploration, where the diet lacked the antiscorbutic elements, men performing hard manual work have frequently been the first to sicken of scurvy. In the East and West Indies, where the diet consists too exclusively of polished rice and is lacking in B vitamins, beri-beri frequently attacks expectant and nursing mothers as well as gangs of coolies performing heavy work. Where the diet is deficient in calcium salts and phosphates (as, for example, in Northern China and North-West India), it is chiefly the child-bearing women who suffer from osteomalacia¹, although the men are also affected if the deficiency is very severe. Special need for protective food arises in cases of expectant and nursing mothers, who have to perform extra nutritive functions in addition to nourishing their own bodies. Growing children also require an abundance to provide nourishment for their growing tissues and the younger the child the greater the need for the protective foods. In these cases, there is special need for an adequate mineral and vitamin supply and for "good" protein. The results of deficiency may remain latent for some length of time in a manner analogous to the incubation period of an infective disease of low virulence, such as tuberculosis. Malnutrition, especially in children, affects not only the physical health, but also the mental development. It is a great evil at all ages, but there are specially sensitive periods when the organism is growing ; such are found in uterine life, in early childhood and in adolescence, when the ill-effects of faulty nutrition are much more serious and may even be irreparable.

(a) *Expectant and Nursing Mothers.*

There is good reason to believe that a large amount of sickness and disability associated with child-bearing, and the high mortality rates of pregnant women, could be substantially reduced by improved feeding of these women. During pregnancy and lactation, the mother has not only to be supplied with all the nutritional factors necessary for her own health, but has also

¹ See footnote, page 6r.

to sustain the extra burden of having to provide many essential chemical substances for the development of the growing embryo and foetus. It is undoubted that many modern diets are deficient in certain chemical substances and bring about much ill-health to the mother as well as defective development and diminished resistance of the foetus and infant. One of the commonest defects in modern civilised diets is a faulty mineral supply leading to disordered calcium metabolism, so that the mother has to sacrifice the calcium salts of her own bones for the developing offspring. This deficiency may be so great as to result in osteomalacia, but, whereas this is rare in European countries, smaller defects in calcium metabolism are undoubtedly common. This is evident in the increased tendency to dental caries in women at these times. Other distressing complaints during pregnancy, which are apparently related to the defective calcium nutrition, include muscle soreness and weakness, and the consequent inability to perform ordinary daily activities, which is generally not relieved by rest during the day or on retiring at night; also, the inability to sit or lie long in one position, a condition often associated with intervals of more definite muscle spasm and contractions which may be quite severe. In an investigation made in America on 576 cases of pregnancy, 316 complained of symptoms of this nature. In almost all these cases, relief followed the administration of additional calcium and vitamin D.

In a Norwegian investigation, eleven women out of sixteen were found in a condition of negative calcium balance towards the end of pregnancy—that is to say, these women were losing more calcium from their body than was provided in their food, and this negative balance was made positive by increasing the daily calcium intake by providing them with about two pints of milk a day. Other sources of vitamin D, such as cod-liver oil or egg-yolk, were also effective in improving this condition.

Another substance which is likely to be deficient in the diet of pregnant women is iron, of which the maternal organism has to supply a relatively large quantity to the foetus. A large proportion of women of child-bearing age suffer from simple anæmia, and this condition is exaggerated by pregnancy and lactation. Thus, in an investigation made at a hospital in London,

rather more than 50% of nursing mothers had a hæmoglobin content of the blood of less than 80%. This common deficiency can be repaired either by giving iron salts in pregnancy or, better still, by giving foodstuffs rich in iron, such as meat, egg-yolk and vegetables.

It is well known that a deficiency of iodine in the diet of pregnant women may be of great significance. Only small quantities of iodine are necessary to supply the demands of the offspring at this time, but this minimum is essential to prevent prenatal abnormality of the thyroid gland, which predisposes the child to simple goitre, and, if sufficiently severe, to cretinism, and ordinary foodstuffs are so deficient in iodine that it is sometimes impossible to ensure even this small amount. In some countries in Central Europe, this difficulty is overcome by giving iodised salt in food—that is to say, sodium chloride containing 1 part of sodium iodide in 200,000 parts of sodium chloride. As regards natural foodstuffs, sea fish is the only rich source of iodine and, where procurable, this ought to be included in the diet of all pregnant women once or twice a week. Otherwise, it is essential to add iodised salt to the food. Japan is the only country which is free from goitre (about one case per million of population). This is due to its high consumption of foods of marine origin, all of which contain iodine.

There is evidence that vitamins are commonly deficient in the diet of pregnant women. The commonest deficiency is probably that of vitamin D; vitamins A and C are also ingested in deficient amount in many instances. These dietetic defects, except in the case of vitamin D, can be readily overcome by including such protective foods as milk, eggs, green and other vegetables and fruit in the diet. Where there is lack of sunshine, vitamin D can be provided in abundance in the form of cod-liver oil or of some preparation of the vitamin itself.

(b) *Infants.*

The importance of breast-feeding. — Complete breast-feeding of infants is of very great importance. It is cheaper, simpler and cleaner than artificial feeding and, in the case of a properly

fed mother, the benefits brought to the infant are great. Impressive evidence on this point was supplied by a large-scale enquiry reported from the Infant Welfare Centre of Chicago, in which 20,061 infants attending the centre between the years 1924-1929 were closely followed up for the first nine months of each infant life. Of these, 48.5% were wholly breast-fed, 43% partially breast-fed, and 8.5% wholly artificially fed. The artificial feeding was carried out on a definite plan, and all the infants—artificially fed and otherwise—were attended at intervals by the officials of the centre. The mortality rates of these different groups of infants were as follows :

	Number of infants	Total deaths	Percentage of deaths of infants
Wholly breast-fed . . .	9,749	15	0.15
Partially	8,605	59	0.7
Artificially fed	1,707	144	8.4

It will be seen that the mortality rate among the artificially fed infants is fifty-six times greater than that among those completely breast-fed. The difference in the death-rate between these classes of infants was largely due to deaths following respiratory infections and, to a less degree, gastro-intestinal and other infections. Thus, whereas only four out of 9,749 of the breast-fed infants died of respiratory infections, eighty-two out of the 1,707 artificially fed infants died from this cause.

No clearer evidence could be obtained to enforce the advantages of breast-feeding as compared with artificial feeding. Similar impressive evidence on the value of breast-feeding was afforded by the enquiry of the League of Nations into the causes of infant mortality in six European and four South-American countries, which also demonstrated the part played by bad feeding in infant mortality. Where this mortality was low, the digestive troubles usually caused by defective feeding were rare ; where it was high, digestive troubles were very prevalent—they were the outstanding cause of death, and it is by reducing them that mortality can be reduced. Conversely, where breast-feeding was general, the “ nutritional peril ” was usually small ; where artificial feeding predominated,

it was great. But, although the superiority of breast-feeding over artificial feeding with cow's milk has been demonstrated, breast-fed infants may yet be improperly nourished if, in addition to their mother's milk, they are given other untimely or unwholesome food, or do not receive the necessary vitamins in the form of supplementary foods.

The increased frequency of respiratory, gastro-intestinal and other infections in artificially fed infants and the resulting greater mortality can be ascribed to two causes. One is the " food peril " itself, which may be due to the infected milk of an artificial diet or to the irritating and indigestible nature of other constituents, and the other is the diminished degree of resistance to infection produced in infants fed on artificial diets as compared with those receiving mothers' milk. All milk which is given to bottle-fed infants should be boiled.

Common nutritional defects of infants. — The necessity for proper feeding of the nursing mother in order to allow the maintenance of her own health, to ensure the presence in her milk of a good supply of all the essentials for the infant's health and development, and even for the continuation of an abundant milk secretion, has been mentioned above. In breast-feeding under good conditions, the need for giving supplementary dietetic substances to the infant is diminished. In most cases, however, it is advisable to include cod-liver oil to supply additional vitamins A and D and iodine, and some form of vitamin C, such as orange juice. Where this is not available, the juice from grated raw potato, cabbage, carrots or turnips will serve equally well. Great care should be exercised that the vegetables be thoroughly washed, and the hands should be thoroughly clean before preparing the juice.

Infants at birth have an abundant supply of iron stored in their livers and, in the period of milk-feeding, these stores are gradually used up so that the hæmoglobin in the blood is reduced from 100% at birth to about 70% at the age of three months. This can be regarded as a physiological type of anæmia, as it occurs in practically all infants, both breast and artificially fed, although the fall is more severe and the recovery during subsequent months less in artificially fed than in breast-fed infants. The administration of iron to these infants will raise

the hæmoglobin level to 77% and upwards in the period from 5 to 12 months of age. In untreated infants, the hæmoglobin will generally drop from 70% at 5 or 6 months of age to 65% at 12 months of age. It has also been shown that the infants with low hæmoglobin in their blood have a much higher sickness rate due to infections than those receiving iron. The need for including iron-containing foods, such as egg-yolk or some form of iron itself, into the diet of infants over 6 months seems evident.

Even in the case of breast-fed infants, it may be desirable to give dietary supplements, but the need varies according to the climate. Thus, infants born in the tropics and exposed to much sunshine may need no extra vitamin D. Where infants are not so exposed it is of great importance that the diet should have a high calcifying value from birth onwards to ensure perfect calcification of the developing teeth and the proper growth of the jaws, preventing subsequent irregularities of the teeth. Such a diet will also prevent rickets and osteoporosis ¹ and ensure the formation and growth of good bones.

In the case of the artificially fed infant, the inclusion of vitamin D and other specific protective substances is of much greater importance. Such infants ought always to be given cod-liver oil, orange juice, or some other product rich in vitamin C, also egg-yolk, because the common illnesses of infants, such as rickets, defective formation of teeth and anæmia, are much more frequently found in artificially fed than in breast-fed children, while gastric and respiratory infections in the former are much more likely to be severe and even fatal.

There is a common practice nowadays of including cereal and cereal products in the diet of young infants. The immediate effect of giving such foodstuffs is often apparently beneficial, as indicated by the increase in weight. The modern teaching of nutrition, however, is against giving cereals before 8 months or so, and even then only small amounts should be given. Many cereal products are very poor in vitamins and available mineral elements and their inclusion in the diet limits the intake of milk and other protective foods. There

¹ Osteoporosis is a condition of the bones in which the substance which gives them hardness—*i.e.*, calcium phosphate—diminishes. Such bones easily fracture.

is also evidence that they actually are harmful in the sense that they increase the demand for vitamins A and D and calcium and that their own calcium and phosphorus content are not available for the formation of bone in the growing organism under some circumstances. Thus a rapidly growing infant nourished with cereals is more liable to suffer from defects of calcification of the bones and teeth than one on a diet of milk and other protective foods only. It is probable also that the consumption of cereals by these young infants diminishes their resistance to broncho-pneumonia, intestinal and other infections.

The enquiry made by the League of Nations into the causes of infant mortality referred to above made it clear that the pernicious combination of poverty and ignorance was largely responsible for malnutrition in infancy, as, indeed, for that seen in other stages of human life.

(c) *Early Childhood, Pre-school Age, Nursery-school Age.*

As a rule, maternal and infant welfare institutions do not yet follow the child beyond the end of its second year, and there is consequently a gap in the health supervision between infancy and school age. Yet that is the time when malformations of the bones, dental defects and abnormalities of the pharynx appear. They will be discovered by the school medical officer, but it will then be too late to prevent and, in some cases, to remedy them. It is desirable to prevent these causes of chronic ill-health as far as possible by procuring improved feeding of children in these early years, both by extending the application of social services and infant welfare institutions forwards, or of the school medical services backwards to this age, and by increasing the knowledge and means of poor parents for better feeding of their offspring.

By the time children enter school, at the age of 5, large numbers show some form of physical defect and, although there is no proof that all of these defects could have been avoided by improved feeding, there is good evidence that many would not have developed under such conditions. In a recent

enquiry (1931) in London schools, it was revealed that, among children of 5 years of age, there were from 67% to 88% of cases of abnormalities of the bones, 67% to 82% (according to the gravity of the symptoms) of cases of adenoids, enlarged and septic tonsils, and other disorders of the pharynx, 88% to 93% having badly formed or decayed teeth. There is evidence that the defective bone formation and much of the dental decay among these children would have been avoided by the inclusion in their diet of large quantities of the protective foods, such as dairy products, and therefore less reliance upon bread and other cereals. How serious and widespread may be the defects in the feeding of children at this age can be seen in the following example : in 1921, in a city in the United States, out of 6,015 children of pre-school age, 90% were found to be receiving an inadequate diet according to current standards, 57% never received any fresh milk, 16% no milk of any kind, 59.5% no eggs, 60% practically no fruit, 50% no vegetable other than potatoes. As an aggravating circumstance, these dietary deficiencies were accompanied by a lack of proper rest or sleep. Is it any wonder that so many of the children beginning school life show physical defects and mental inactivity ?

It is just at this age that there is great need to maintain the resistance of children at the highest possible level against the ravages of the infectious diseases to which they will be exposed, such as measles and scarlet fever, and especially their sequelæ, broncho-pneumonia, middle-ear disease and nephritis. These diseases, if they do not kill, often leave the child with some chronic disorder which disables it for life. It is, for instance, at this age that deafness often has its starting-point owing to infection of the ear following measles and scarlet fever. Below the age of 3 years, measles is a particularly deadly disease, and there is suggestive but not conclusive evidence that the high mortality rate at this and older ages could be reduced by better nutrition of such children.

(d) *School Age.*

In the early years of school life, many children are already "damaged goods". They frequently show evidence of

previous defective feeding and lack of care in deformity of the bones of the limbs, chest and head, in bad dental structure often associated with decay, in deafness to a greater or less degree, in running ears, septic tonsils and adenoids, and in simple goitres. These indications of disease are not generally, however, from the present medical point of view, regarded as evidence of malnutrition and, indeed, there is no definite proof that some of them—*e.g.*, running ears, enlarged and septic tonsils—would have been prevented by proper feeding from early life, although this is probable. During the past fifteen years, the effectiveness of the provision of iodine in preventing goitre has been demonstrated on a large scale in several areas.

Malnutrition is usually diagnosed in school-children on the basis of subnormal growth and weight and general sickly appearance of the child. Nothing is more important than that a new attitude should be adopted towards this problem, for whereas such results of improper feeding as subnormal growth and weight and undefined general ill-health can usually be rapidly improved by better feeding conditions, the more chronic conditions due to earlier defective dieting cannot be so easily remedied, but continue to act as a handicap throughout life. The system of medical inspection of children that is now generally established under State control in different countries must be sadly handicapped so long as it has to deal with many children who come under its control from the beginning in a pathological state. Prevention rather than treatment of disease must be more and more emphatically stressed and, so far as this can be procured by better feeding, this ought to be done.

Even, however, on the present basis of diagnosis, there is abundant evidence of malnutrition in school-children. From 20 to 30% of school-children were found to be under-nourished in the poor quarters of Paris ; in some cases, the only meal the children had during the day was that provided by the school canteen. Such cases are reported as frequent in Yugoslavia. In Poland, according to a recent estimate, 25% of school-children are ill-nourished in certain regions, 7% are threatened with tuberculosis, while additional meals should be given to at least 50% (according to documents received by the

Mixed Committee). In the United States, $7\frac{1}{2}$ million school-children were under-nourished in 1933, according to a statement by the Secretary of Agriculture.

In 1917, according to specialists in rickets, nearly all the children of the negro population of New York were suffering from this disease; 83% in Connecticut in 1923; 43.4% in the villages in the north of Norway in 1931; 33 to 67% in two northern counties of Sweden. Rickets is still an important social disease in England, although the discovery of its ætiology and means of prevention is gradually causing its reduction. As regards dental caries, the enquiries carried out in various European countries have shown it to be present in from 50 to 95% of the children examined. In a recent enquiry undertaken in Norway, only 160 out of 25,000 school-children examined possessed perfect sets of teeth. According to the English report mentioned above, out of 3,303,983 children examined in 1933, 2,263,135 needed dental treatment. Dental caries frequently result in abscesses at the roots of the teeth. From these abscesses, disease-producing organisms frequently enter the blood and set up infectious processes in the joints, kidneys and other sites. Dental caries lays the foundation for much serious ill-health.

It is true that all these observations have not been based on uniform tests and that the state of ill-health of children likewise depends on other causes: sequelæ of previous infectious diseases, faulty hygiene in the home and inadequate amount of sleep and exercise in the open air.

So far as greater height and weight, muscular strength, general vitality and more vigorous activity are concerned, there is definite proof that much can be done by improved feeding of school-children. The evidence is of two kinds: first, derived from observations in which diets of school-children in boarding-schools have been constant over a period of years and then changed over a further period of years; and, secondly, from experiments in which milk or some other supplement has been added to the dietary over a period of months, and the effect of this change on the children noted. An example of the first of the experiments is seen in one English Public School, where the diet was closely controlled over the years 1913 to 1933. Between

the periods 1919-20 and 1928-29, there was a substantial increase in milk consumption, butter was substituted for vegetable margarine and there was a decreased consumption of bread. Associated with these changes in the diet, the average height of boys of 11 years of age increased from 4ft. 6.65in. to 4ft. 7.33in. and that of boys of 15 years of age increased from 5ft. 2.89in. to 5ft. 3.97in. There was a correspondingly large increase in weight of these children during the period of improved feeding. Curiously, two other improvements in general condition, probably due to increased milk consumption, were observed which are of great significance — namely, (a) a great decrease in fractures of bones in accidents, and (b) a decrease in rheumatism and rheumatic conditions.

The effect of adding milk and other supplements to the diet for a period of one year was, according to an English writer, equally dramatic in its action. A pint of milk added daily to what was considered a good diet in an institutional boarding-school caused in boys of 6 to 11 years old an increase of 2.63 inches in height and of 6.98 lb. in weight as compared with increases of only 1.84 inches and 3.85 lb. by similar boys who did not receive the supplement of milk. It was also remarked that there was much less illness among the extra-milk children, especially naso-pharyngeal catarrh, a reduced tendency to chilblains, a better condition of the skin, while the children were more alert and high-spirited. Burnet and Aykroyd have given accounts of other similar experiments on adding milk to the diet of school-children, and it may be taken as completely proved that the addition of milk to the diet of school-children would greatly increase their average height, weight, strength, vitality and general health.

Since school-children do not develop rickets or bone deformities, but only carry the stigma of earlier attacks of this disease, it is often assumed that they do not require so much milk to supply calcium as in earlier years. There is an element of truth in this idea, but only an element. The bones and teeth of school-children are growing and calcifying rapidly, and defective calcification of bones makes itself obvious by the ease with which they break. The frequency of bone fracture is a great social problem in some countries, especially in industrial

countries, and deserves more attention than it receives, and there is little doubt that this trouble would be greatly reduced by the consumption of larger quantities of milk and other protective foods.

Another important problem of child health is the tendency, during the school age, to contract acute rheumatism with its tragic associates, chorea, heart disease (rheumatic endocarditis), one of the commonest causes of chronic disability, ill-health and early death in some countries. If the greater consumption of protective foods can reduce these distressing conditions—and there is some suggestive evidence that it can do so—a great blessing would be conferred on mankind.

Compulsory education has been generally adopted throughout the civilised world. It is agreed that large numbers of school-children are not mentally or physically capable of profiting by this universally accepted recognition of the social obligation to educate the mind of every individual. Might it not be as well to make such children more physically and mentally fitted to benefit fully from these educational facilities by assuring that their nutritional needs are fully satisfied ?

(e) *Adolescence.*

The state of nutrition among adolescents is much less accurately known than among school-children. All authorities on the subject are, however, agreed that, under normal conditions of life, this is one of the most crucial periods. The rapid rate of growth of the adolescent makes abundant and efficient nutrition particularly important and yet this is a period when the State ceases to show a maternal interest in his physical well-being. There is evidence that, even in the case of boys and girls entering good employment at the age of 14 or 15 with reasonably good physique, they suffer much deterioration by the age of 18, a condition which is largely due to insufficient and unsuitable food eaten during this period.

This is the age when the most serious cases of pulmonary tuberculosis occur. Every tuberculosis specialist is convinced that the appearance of tuberculosis before the twentieth year is due to two main causes : overwork and malnutrition.

Although the general incidence of tuberculosis has been decreasing in many countries gradually during the past 100 years, and especially during the past thirty years, it is a distressing fact that this rate of reduction does not occur to the same extent in the case of adolescent and young adult people. Indeed, in young women there has been an increase in tuberculosis during recent years in some countries. This state of affairs has been ascribed by some to the modern habit of "slimming", by others to the greater expenditure dictated by modern habits of life on clothes, which leaves too little money for the purchase of proper food. Whatever may be the real explanation, it is undoubted that many adolescents in all countries, but particularly in industrial countries, are being improperly nourished at the present time and are suffering in consequence. Efforts of an educative nature ought to be taken to make adolescent boys and girls realise that the best health and the fullest physical and mental development is only possible if their dietary contains an abundance of the protective foodstuffs.

(f) *Young Soldiers.*

Military service claims young men at the end of adolescence, before they are fully mature. The rejection as unfit of a proportion of the men called up is not evidence that malnutrition is the only cause of their rejection, but military doctors do, in fact, assert, on their knowledge of the facts, that malnutrition is one of the main causes. In Belgium, as a result of the examination of 49,000 recruits in 1931, it was found that physical fitness had declined as compared with pre-war statistics, and among the causes (increase in school work, unemployment, excessive championship-hunting in sports), the defective feeding of children during the war and the increase in the incidence of diseases of the digestive tract are ranked first. In Denmark, a third of the recruits present a combination of symptoms known as "Danish disease" (flat feet, varicose veins, pains in the extremities and cramp in the calf of the leg). In Finland, notwithstanding the very high level of athletic attainments, 21% of recruits are rejected, and doctors attribute this to general

malnutrition among the poorer classes. In Poland, where there is a mass of evidence to show the vast extent of malnutrition, the proportion of recruits rejected is extremely high. It is a pity that the examination of recruits is not made more use of as a means of enquiry into malnutrition. How can we help being alarmed when we learn that, in the army of a large European nation, the proportion of men rejected for physical unfitness has risen, between 1923 and 1932, from 45.25 to 67.78 per thousand ?

(g) *Adults.*

Every fresh enquiry, in town or country, reveals either patent or latent malnutrition.¹

The recent history of the high incidence of malnutrition among adults seems to be identified with that of unemployment. If unemployment has not augmented the evil of malnutrition to the extent that might have been expected, it is because malnutrition has been held in check by the development of Public Health Services. The effect of unemployment relief is reflected in an improvement in the diet of the unemployed. On the one hand, expenditure of energy and food requirements were diminished, and, on the other, when large-scale social organisations take care of the unemployed, the latter's diet, though less abundant, is often more rational.

It would be a mistake to believe that, generally speaking, unemployment produces no harmful effects. Its effects are to be sought, not so much among the adult unemployed as among their growing children. For more than two years now, in the United States of America, the Children's Bureau has been collecting information of different kinds from various sources which proves that the depression is having an increasingly bad effect on the nutrition and health of children. Thus, according

¹ In the United States of America, according to a recent communication from the Cost-of-living Division in the Ministry of Labor, of 209 families examined in the North-Atlantic States, 14 % were found to be under-nourished "from every point of view". In Yugoslavia, the so-called "passive" regions, which produce neither wheat nor other vegetable foodstuffs, are suffering to a great extent from malnutrition owing to the exiguity of their purchasing power. Among certain classes of workers, wages are not sufficient to provide an adequate dietary, particularly when there are not enough wage-earning members of the family. In certain districts in Northern Sweden, where agricultural production is scanty and foodstuffs are scarce, a deficiency of vitamins has been observed. Cases of anæmia and scurvy are not infrequent.

to the New York City records, the percentage of school-children in a bad state of nutrition rose between 1929 and 1932 from 16 to 29 in Manhattan and from 13 to 23 in the Bronx. At Philadelphia, among young children under 6 years of age examined at the "Community Health Center", the figure rose from 11 (1928-1930) to 24 (in 1932).

The ravages caused by rickets, the most serious deficiency disease in countries of the temperate zone, have been described above in the section on children. It is in adult women, however, that one of the most serious disabilities of rickets becomes manifest, although the cause of the trouble has really started in the young and adolescent stages of life. The condition referred to is contracted or rickety pelvis, a defect frequently found in women in industrial centres. The small size and deformed shape of the pelvis in such women prevents the easy birth of the infant. A greater call on surgical interference is therefore made in child-birth under such circumstances, and this not only means greater distress to the mother, but also an increase in the liability of these women to puerperal fever, one of the commonest causes of death after child-birth. This is one of the best examples that can be given of the importance of prevention when dealing with a common and widespread disorder. The problem of the large number of deaths associated with child-birth is rousing much interest in some countries. Surely an essential point in any attempt to diminish this serious state of affairs is first to ensure fully developed and perfectly formed pelvis bones in child-bearing women by proper feeding of female children and adolescents. If this were attained, surgical help in child-birth would be much less needed and there would undoubtedly be a diminution in maternal mortality.

Another deficiency disease, pellagra, still plays havoc in temperate countries and causes 3,000 deaths a year in Roumania and 4,000 in the United States of America. If complete data were available, deficiency diseases, whether patent or latent, and their sequelæ, would probably be found to occupy a far more important place in the annals of malnutrition than at present appears. Certain diseases which were thought to have been stamped out or to have become very rare are again making their appearance. In connection with the privations caused by

the war, Danish doctors noted a sort of recrudescence of diseases of the eye caused by nutritional deficiencies, including a deficiency in vitamin A : thickening and opacification of the cornea, and weak vision, particularly at dawn and dusk. These symptoms would be detected more frequently if they were looked for more often.

There is considerable evidence of the influence of defective feeding on the tuberculosis death rate. The figures must be treated with caution, because in most cases other physical and mental causes are present, such as overcrowding, slums, overwork and worry. But no doctor who has had any experience of tuberculosis will deny the influence of diet upon the outset, progress and also the prevention and cure of this disease. Moreover, there have been, in the recent history of Europe, during and after the war, certain sad exceptional periods distinguished—unenviably—by food restrictions with which have coincided a very marked recrudescence of tuberculosis mortality : in the United Kingdom as from 1915, in the Netherlands as from 1916 and in French Flanders during the enemy occupation ; in Germany, during the war and during the inflation period of 1922-23. A few months after the cessation of the restrictions or blockade, the death rate fell to its pre-war figure. Generally speaking, it had been higher in the towns than in the country, because the country population could grow their own food and thus were not affected by some of the restrictions. In Denmark, the tuberculosis death rate, which had been steadily falling before the war, increased a little during the war as a result of food restrictions, although at that time there was no housing shortage. Subsequently, after the war, the tuberculosis death rate resumed its downward trend in spite of a prolonged housing shortage ; circumstances had dissociated two of the causes of tuberculosis mortality—housing and nutrition—and had demonstrated the outstanding importance of the latter.

Tuberculosis in industrial centres, although diminishing in incidence, is still one of the great killing diseases. It must also be remembered that, although this disease is being gradually reduced, the rate of reduction is much smaller in adults than it is in children. In fact, in dealing with adolescents, it was pointed out above that the incidence of tuberculosis in young women

(15-25) and to a less extent in young men has actually increased in some years during the past decade. Apart, however, from adolescence, the death rate due to tuberculosis in the adult is still very high, and it may be hoped that a wider adoption of the teachings of the present report by adults will bring about a substantial decrease in incidence, together with a corresponding fall in the death rate. Bronchitis, like tuberculosis, is a more deadly disease among poor people than among the well-to-do, in contrast to the greater frequency with which diabetes mellitus and appendicitis occurs among those with more money to spend. The position as regards the question of some relationship between bronchitis in the adult and malnourishment is similar to that of tuberculosis—that is to say, there is only suggestive, but not established, evidence of a direct correlation. Here again, therefore, it is possible that an increase in the consumption of protective foods, especially by poor people, would reduce the incidence and death rate due to this disease.

Though further enquiries will be necessary to establish the influence of certain given foodstuffs on human susceptibility or resistance to infection, there can be no doubt as to the general value of a proper diet in increasing resistance to disease.

5. THE MODERN SCIENCE OF NUTRITION AND THE LONDON REPORT.¹

The New Science of Nutrition.

In determining human dietary standards, physiologists in the past have generally devoted their attention to minimum requirements. Such was the usual standpoint of Governments and administrations when called upon to fix the rations for bodies of workers, or to feed large masses of soldiers and civilians in war, or when obliged to assist the unemployed and their families during the time of industrial depression.

The idea of an *optimum* diet, on the other hand, has been developed and brought into pre-eminence by modern science.

¹ The London Report on "The Physiological Bases of Nutrition" by the Technical Commission of the Health Committee in November 1935. It was subsequently revised and amplified and reproduced as Volume II of the interim report of the Mixed Committee on Nutrition (1936).

An optimum diet is one which provides for the full development of the individual for efficiency without exhaustion and for his resistance to disease.

The standard for adequate nutrition, like the standard for hygiene in general, cannot be limited to that required for the prevention of avoidable diseases by means of a minimum or barely adequate diet; the business of adequate nutrition is to create health by means of the optimum diet.

Many of the well-recognised vitamin-deficiency diseases—such as scurvy, rickets, beri-beri, pellagra—are caused by severe, prolonged deficiency of one or other of the essential protective vitamins. Except for rickets, they are, fortunately, of relatively rare occurrence in temperate regions, and their full manifestation can usually be prevented by a minimal intake of the appropriate preventive factors. Much more common are the latent states of malnutrition, which may give rise to no visible disease—states which might be called pre-scurvy, pre-rickets and pre-osteoporosis, pre-pellagra, pre-beri-beri, pre-caries or the formation of teeth of imperfect architecture. The opportunity that lies before the science of preventive nutritional medicine rests upon the knowledge that these states exist and upon the proof of the necessity for striving after *optimum* nutrition rather than *minimum* nutrition.

In this connection, it has been observed that nutritional research will exercise a greater influence in preventive medicine by increasing the vitality of the human species, with all that that implies, than by preventing the frank “deficiency diseases”. The importance of this fact has not yet been fully recognised. The health of the individual, in the majority of cases, is destroyed, not so often by severe attacks of illness (which are more in the nature of accidents), as by the gradual action of persistent but unrecognised causes, of which one of the most important is a badly composed dietary. This is one cause of inferior physical development and nervous instability, of lack of recuperative power and endurance, and consequently of cumulative fatigue and lack of resistance to tuberculosis and other infections. Moreover, the diet largely influences the rate at which the organism ages and consequently the duration of life.

Preventive action against such nutritional diseases as scurvy, rickets and beri-beri, although superficially more impressive, is probably of less importance to the human race than the acquisition and application of such knowledge as will also improve the general condition and well-being of every man, woman and child, through the better choice, provision and utilisation of foodstuffs.

Such are the principles underlying the work of the Commission of Physiologists appointed by the Health Committee which held its first session in London at the end of November 1935.

6. DIETARY STANDARDS ADOPTED IN THE LONDON REPORT.

The Assembly resolution of 1935 recommended that the technical organisations of the League should make a study of nutrition in its relation to public health, labour, agriculture, trade and social progress. The basis of this work being the science of nutrition, it was necessary to obtain a pronouncement from nutritional experts as to the nutritional needs of the human being in the course of its development, from conception to the adult age. This pronouncement is contained in the report of the London Commission.

The question of human nutritional requirements has been under the close consideration of physiologists during the last three-quarters of a century, their conclusions being based either : (1) on the average spontaneous consumption of population groups ; (2) on statistics of food production and food imports and exports for a nation or a city ; or (3) on direct experiment with calorimetry on animals and human beings. The answers given by the scientists are matters of importance for public health, labour, agriculture, trade and public and private finance, and have been both numerous and varied. This circumstance has been a matter of amusement at times to the layman, but a source of anxiety and difficulty to the medical men and administrators who have to prescribe for individuals and to feed communities and masses of the population. Opinions regarding the necessary number of calories

follow two tendencies : one towards the maximum and the other towards the minimum requirements.

In the report of the Technical Commission, the two aspects of nutrition, the quantitative and qualitative, and the fundamental importance of protective foods, are brought out by the division of the report into two parts : I—dealing with energy, protein and fat requirements ; II—dealing with mineral and vitamin requirements. In both parts, the dominant idea is the needs of the human being during development. At the beginning of life, the child is inseparable from the mother, and additions, not only of energy, but also of protein and of all protective elements, are prescribed for pregnant women, nursing mothers, infants, children and adolescents.

(a) *Energy Requirements.*

The human race is not made up of arithmetical units, but of adults, adolescents and children of both sexes ; of childless women, pregnant women and nursing mothers ; of workers both manual and sedentary, and of idlers. If the ration for an adult male (and, even so, what type of male adult is meant ?) is taken as unity, what is the proper fraction for a woman, or for a child at different ages, or for an adolescent at different stages of growth ? In other words, what coefficient is to be used for conversion of the standard to the appropriate figures for each class ? There are in existence a score of scales of coefficients among which physiologists and hygienists can choose. The need is now felt, however, for a common scale which will allow of uniformity in national and international comparisons. The question was considered by the Rome Conference of Experts (1932), but only a provisional solution was reached. The questions of the standard calorie ration for the male adult and of the scale of coefficients were therefore dealt with at the London meeting.

Instead of adopting a mean figure representing the needs of an adult man performing an average but indeterminate output of work, the Commission fixed a basic figure representing

the requirement for maintenance to which supplements are to be added for work, growth, pregnancy and lactation. This basic figure represents the need of the average adult, male or female, living an ordinary everyday life in a temperate climate and not engaged in manual work. The needs of such an adult are stated to be met by 2,400 calories *net* (*i.e.*, after deducting waste in cooking and at table) per day. Most authorities have agreed upon this figure for the type of adult under consideration; and it so happens that the figure is convenient for calculation on a basis of 100 calories per hour. Conditions and age being equal, no difference is made between the sexes.

As the amount of muscular effort varies with the occupation and the number of hours of work, it is convenient to calculate the supplements on an hourly basis. Four grades of work are distinguished—light, moderate, hard and very hard—within which it will be possible for hygienists and engineers to place any given form of work.

(b) *Protective Foods, Mineral and Vitamin Requirements.*

In Part II of the London report, stress is laid on the need for protective foods. These are expressed in everyday terms as milk, butter, cheese, eggs, meat, potatoes, fresh green vegetables and fresh fruit. Sunlight is also reckoned as a protective nutritional agent, because it generates vitamin D in the organism.

Milk.

The need for milk in the human dietary. — The use of the milk of cows and other mammals in the diet of the human race is as old as the history of mankind, and during the long ages in which it has been thus used its value has ever been highly esteemed. A land “flowing with milk” was the ideal of pastoral tribes in ancient times and will still remain the ideal, if the correct nutrition and health of the people receive due consideration.

The value of milk is well demonstrated by a survey of the dietary habits of the different native races inhabiting the world.

Fine physique, good health and virility are usually seen in races where milk has an important place in the diet, as, for example, amongst the Arabs and other races inhabiting South-Western Asia and South-Eastern Europe. The contrast in health, strength and stamina is proverbial between the Hill tribes of India, who partake largely of milk, and those dwelling in the plains, where the diet is more exclusively vegetarian and consists largely of cereals.

Modern scientific research has entirely confirmed the empirical conclusions drawn from human experience as to the dietary value of milk. Milk, which is designed to afford complete nutrition to the mammalian young, is known to contain all the factors needed for satisfactory nutrition, combined in a suitably proportioned mixture of :

- (1) Protein of good quality,
- (2) Fat,
- (3) Carbohydrate,
- (4) Mineral salts,
- (5) Vitamins.

In this respect, *milk is the nearest approach we possess to a perfect and complete food, and no other single food is known that can be used as a substitute.* If this had not been so, milk would long ago have disappeared from the dietary of civilised peoples, especially of those dwelling in cities. For milk is not only the most *nutritious*, but is also the most *inconvenient*, and at times may be a *dangerous* foodstuff. For its high nutritive value makes it also a perfect medium for the growth of other organisms, including bacteria. In other words, milk will not “ keep ”, and an elaborate organisation is needed to bring it regularly to the consumer in a fresh condition. Apart from the bacteria concerned with the “ natural ” processes of souring and putrefaction, milk may also act as a vehicle for the spread of the germs of definite disease, such as tuberculosis, diphtheria, typhoid and scarlet fevers. The reason why, in spite of these drawbacks, we continue to include milk in our diet is because *its value is unique.* Evaporated milk, dried whole milk and dried skim milk are more economical than fresh milk and have been found extremely

useful in areas with inadequate dairy herds, where the quality of the fresh milk used in their production has been properly safeguarded.

It is true that it is possible to secure a fully adequate diet except in infants and young children without the inclusion of milk. This is shown, among other examples, by the physical perfection of the peoples of certain islands of the Pacific when they lived under primitive conditions. They ate a wide variety of vegetable foods, supplemented with fish, turtles, shell-fish, etc. But such foods as were available to them are not available to people subsisting on the agricultural products of Europe and the Americas. In these geographical areas, the products designated as protective foods must be made available in greater abundance for the protection of health.

Another reason why the importance of milk is stressed for these populations is that milk production on a large scale is economically sound in large areas, not only because of its unique value as a food, but also because dairying conserves soil fertility to a greater degree than does most other types of agriculture.

The nutritive value of milk. — (i) The *proteins* contained in milk, lactalbumin and casein, possess a high nutritive value, since the amino-acids of which they are composed make them especially suited to supply the requirements of growth in the young, as well as of maintenance in the adult.

(ii) *The carbohydrate* is present in milk in a soluble form, as milk-sugar.

(iii) *The fats* of milk are present in an emulsion of different fats of low melting-point. Milk-fat, when separated as butter, is the most digestible and acceptable fat known to us and is a source of the vitamins A and D.

(iv) *Minerals*: cow's milk is one of the foods richest in salts, especially in calcium salts and phosphates. These two *minerals* are essential constituents of every cell in the body, so that an adequate supply is necessary for the maintenance of health at all ages. The amount of lime in cow's milk (1.5—2 parts per 1,000) is only equalled by that contained in some green

vegetables. In milk, however, the lime salts are present in a form specially easy of absorption.

(v) *Vitamins*: while the nutritive value of cow's milk depends to some extent on the diet and management of the cow, yet the nature and proportion of the protein, carbohydrate, fat and salts it contains are maintained with remarkable constancy over a wide range of variation in the type of feeding adopted. There is, however, more variation in the vitamin content, and the highest value in this respect is only found in the milk of cows which are exposed to the rays of the sun and fed on their natural diet of fresh green herbage—*i.e.*, on pasture in the summer ; nevertheless, winter milk remains a valuable foodstuff in this respect. It is true that the amount of the antirachitic vitamin D, so essential for the growing child, is much reduced in winter milk.

Vitamin D, however, whose physiological function is to secure the retention in the body of the lime salts and phosphates ingested in the food, acts with much greater economy when these salts are present in abundance in the diet. In many climates in the winter, therefore, when, owing to the lack of sunshine, the growing child is unable to synthesise vitamin D for itself, an abundant supply of milk is specially needed, for the salts thus supplied will enhance the action of the diminished amount of vitamin D present in the milk and other articles of food.

The composition of the proteins of milk makes them specially adapted for the support of growth in young organisms and gives them a definite supplementary action towards those of cereals, which are inferior in nutritive value. Milk, it is recommended, should represent a large proportion of the diet at every age. The report of the Technical Commission approved the tendency displayed in certain countries to increase the consumption of milk to as much as one litre per day for pregnant women and nursing mothers, and to provide a comparatively large quantity for infants, children and adolescents. For these classes, it strongly recommends free or cheap milk distribution. It calls attention to the nutritive value of *skim milk*, which, although it has lost its fat and fat-soluble vitamins, retains many other valuable nutrients. It therefore deplores the way in which this

valuable food is wasted in many countries. Of other milk products, *cheese* retains the proteins of milk, a large proportion of the calcium salts and vitamins, while *butter* is the most nutritious fat in the modern dietary.

Eggs.

Eggs are important as a source of good protein and of valuable minerals, including iron; the fat contained in the yolk is a rich source of most vitamins, especially of the B vitamins, also of the antirachitic vitamin D, which is otherwise sparsely distributed in foodstuffs.

Meat.

Meat has a special value as a source of protein and iron. Its popularity is chiefly due to its appetising and stimulating properties; but, from the nutritional point of view, the protein of ordinary muscle meat is inferior to that of eggs or milk. The glandular tissues, on the other hand—liver, kidney, sweetbread (pancreas)—are among the most highly nutritious foods we possess, as regards the character of the protein, the mineral and vitamin content. They are also rich in a substance which stimulates the formation of red blood-cells in the bone marrow.

Green and Leafy Vegetables.

Green leafy vegetables are rich in the B vitamins and in vitamin A; they are also among the richest sources of the antiscorbutic vitamin C. Since this vitamin is sensitive to heat, the dietary value of uncooked salads is obvious.

The abundance of minerals and vitamins in green vegetables and the special character of the protein, although present in small quantities, make them of great value, especially as supplementary foods to a diet containing cereals. Just as among pastoral communities the defects of a cereal diet may be corrected with milk and dairy products, so, under other circumstances, correction can be obtained by green vegetables. In the densely populated regions of Southern China, for example, where animal foods cannot be raised, the deficiencies of the rice diet are largely repaired by the abundance of vegetables eaten.

Fruit.

The special nutritive value of fruit depends on high vitamin C (ascorbic acid) content. Different fruits vary greatly in their vitamin C content, the richest being citrus fruits (*e.g.*, oranges and lemons). Tomatoes are also valuable : grapes are relatively poor.

Vitamin C is readily destroyed by heat, so that fruit jams and preserves usually contain none. It is probable that preserved fruits, however, may possess a dietary value due to their mineral content. Oranges, again, are rich in calcium salts, while grapes are rich in iron, and fruits generally may have a special value in supplying mineral constituents to those on otherwise restricted diets. Fruits having a yellow colour—*e.g.*, oranges and tomatoes—are often useful sources of vitamin A owing to their carotene content.

Cod-liver Oil and Other Fish-liver Oils.

The importance of cod-liver oil was stressed in the report of the Technical Commission as a source of vitamin D for infants and growing children, especially for those living under climatic, seasonal and social conditions where sunshine is limited. It is also a valuable source of iodine and vitamin A. Cod-liver oil contains 85 to 100 international units of vitamin D per gramme. The liver oils of the halibut, tuna and of the percomorph fishes (of which the perch is the common type) contain extraordinary quantities of the vitamin. The percomorph liver oils contain as high as 100,000 I.U. per gramme. Although these oils are much less abundant than cod-liver oil, their high potency in vitamin D makes them effective in very small doses, and they are important sources of this nutritive factor.

(c) *Energy-bearing Foods.*

The report of the Technical Commission sets out some specimen diets for various age-groups up to the age of 5 years and for mothers. In these, the report so arranged the protective foods as to yield approximately 1,400 calories per head without the

inclusion of any cereals, fats or sugar. These would have to be added as required to satisfy the energy requirements of any individual, as distinct from his essential mineral and vitamin requirements.

In the general recommendations in its report, the Technical Commission emphasised the following views :

“ Although a simplified diet may be so constituted from a few protective foods as to be satisfactory, it is a general principle that variety in diet tends to safety, provided it contains a sufficiency of the protective types of food materials.”

“ White flour in the process of milling is deprived of important nutritive elements. Its use should be decreased and partial substitution by lightly milled cereals, and especially by potatoes, is recommended. The consumption of an excessive amount of sugar is to be condemned, and in this case also partial replacement by potatoes is urged.”

It will be noted that the report of the Technical Commission recommends the modification in many countries of the proportions hitherto occupied in dietaries by the three foods named.

Cereals.

Cereals form a most convenient and acceptable food of high energy value and for centuries they have been the staple food of the great Asiatic and Mediterranean civilisations. Their value is self-evident ; but, in Europe especially, partly because of the increased availability of protective foods, their consumption has tended to diminish, except under conditions of heavy manual labour or because of limitations in income. At the same time, cereals are being consumed more and more widely in a highly milled form. The report suggests that bread should be made more protective by restoring to the flour, as far as possible, the special nutritive principles contained in the husk and germ of the grain, particularly the vitamin B group. This recommendation, issued at a moment when the question of

different kinds of bread is being discussed in every European country, is of great importance both for economic as well as for hygienic reasons.

Sugar.

In the last thirty years, sugar has become one of the cheapest forms of calories and the consumption has increased manifold in many European countries, especially among the poorer sections of the populations. In the United Kingdom, it has been estimated that a fivefold increase in average consumption has taken place during the last hundred years. Refined sugar, like highly milled cereal products, provides energy without any protective elements. An excessive proportion of sugar in the diet is especially bad for children, whose instinct to eat it seems altogether out of proportion to its nutritional qualities, since it occupies the place which should be filled by protective foods.

Potatoes.

Special attention is called to the value of the potato as a food rich in calories and in starch and is particularly suited to substitute sugar and cereals in the modern European diet. The introduction of sugar and white flour to populations in remote districts has been followed by the occurrence of dental disease previously unknown. Examples are found among the inhabitants of Iceland, among Esquimo and native Indian tribes in Alaska and Western Canada and among the races inhabiting Northern Scandinavia. A large proportion of potatoes in the diet encourages no such predisposition to dental disease as is the case with cereals; populations showing relative freedom from dental disease with high consumption of potatoes are found in certain islands of the Hebrides, in rural Finland and in Poland, and in Tristan da Cunha, in which island at the present time potatoes form a large proportion of the dietary, and dental caries is a rarity. Potatoes are also a valuable source of iron and vitamin C, and one of particular value, because they retain a high proportion of their vitamin C content after cooking.

PART III.

- Chapter 1. — Recent Trends in Food Habits.
2. — Agriculture and Nutrition.
 3. — Food Prices and Consumption.
 4. — Factors influencing Food Prices.
 5. — The Relation of Income to Nutrition.
 6. — The Relation of Education to Nutrition.
 7. — Evidence of Malnutrition in Certain Countries.

Chapter 1.

RECENT TRENDS IN FOOD HABITS.

A. INTRODUCTORY.

1. The remarkable progress made during the past century in transport, refrigeration and finance has greatly influenced the dietary habits of Western peoples. Before these developments, the nature of the diet was of necessity determined mainly by local resources, being largely animal in pastoral communities and becoming increasingly vegetarian with the development of tillage. There were marked seasonal variations in human food consumption. As a result of the technical revolution in transport and the development of international trade, the diet of all peoples became more diversified, adequate and stable.

2. With the progress of science, the influence of national conditions has played a continually smaller rôle. The application of science to agriculture in the course of the nineteenth century resulted at once in the extension of the cultivation of food crops to new areas and in more intensive exploitation—greater yields per acre and per beast—and an increase and improvement in varieties produced. At the same time, methods of handling and preparing foods were improved.

3. In consequence of these changes, the character of the food problem itself was altered. Throughout many parts of the world, it practically ceased to be a problem of hunger and became rather a problem of nutrition. It is, of course, impossible to say exactly when this transition occurred; the process was gradual and imperceptible. It is, however, sufficient to compare our present preoccupations about the qualitative adequacy of diets (their animal protein, vitamin and mineral content) with the famines which decimated whole communities even as late as the first half of the nineteenth century, to realise the enormous progress that has taken place.

4. These technical advances have been accompanied by a change, perhaps as revolutionary in nature, in the science of

nutrition. The importance of *rational* feeding in building the bones, teeth and body in general as well as in maintaining good health has been brought into the foreground of scientific discussion. New criteria of food values have been set up; a beginning has been made in popularising the new knowledge; and the selection of foods on the basis of the new criteria has become a matter of public concern.

5. Until the scientific discoveries of the past fifty years which led to the development of "the new science of nutrition", the food problem was regarded as primarily a quantitative one. Stress was laid chiefly on the energy requirements of the body, supplied by the fats, the carbohydrates and the proteins of the diet.

6. The new science of nutrition adds much to the older teachings, but it does not supplant them. Cereals and other energy-bearing foods retain the important place in human nutrition formerly attributed to them. The modern science attaches special importance, however, to the necessity for supplementing diets which are largely based on the energy-bearing foods with adequate amounts of the so-called "protective" foods—a term originally coined by a member of the Mixed Committee¹ to designate certain foods particularly rich in vitamins and mineral salts. The protective foods on which special emphasis is laid are milk and its derivatives, including butter; green vegetables; fruit; eggs; glandular tissues; fat fish; and, for certain sections of the community, muscle meat. Cereals, sugar and certain fats other than butter are important chiefly as sources of energy. This classification of foods is, of course, general. The protective foods on which stress will be laid in any particular country necessarily depends upon food-consumption habits, local resources, etc.²

* * *

7. Governments, in considering their nutrition policies, will no doubt wish to know whether the changes recommended by modern physiology involve revolutionary disturbances in food

¹ Dr. E. V. McCOLLUM in "The Newer Knowledge of Nutrition" (4th Edition, New York, 1929).

² See also League of Nations: "The Problem of Nutrition", Vol. II — "Report on the Physiological Bases of Nutrition, established by the Technical Commission of the Health Committee" (Geneva, 1936).

habits or whether, on the other hand, their populations have already been tending to change their consumption in the required direction. Moreover, it is necessary to consider the power of agriculture to adjust itself to such changes in the demand for food as may result from encouraging the movement towards better nutrition. For these reasons, it has been thought convenient to trace the changes which have taken place in food habits since the technical changes referred to above began to exercise a real influence on diet, and, in the second place, to examine the part that agriculture has played in connection with these changes in food consumption. This historical survey should enable us to set the present movement towards better nutrition in its proper perspective: to show that ground has already been gained before setting out what remains to be accomplished; to show what changes in agriculture have already taken place before considering what changes may in the future be required; and to indicate what has helped and what has hindered the movement in the past before making suggestions as regards the future.

B. TRENDS IN THE CONSUMPTION OF VARIOUS GROUPS OF FOOD.

8. In default of adequate statistical material, the analysis which follows must be illustrative rather than exhaustive. For the same reason, it deals mainly with Western countries.

9. It will be shown in subsequent paragraphs that the improvement in the dietary of Western nations which has taken place during the past generation has involved, as counterpart to the increased consumption of certain protective foods, a reduction in the *per caput* consumption of certain foods valued mainly for their energy-producing qualities, notably the cereals. This fact has, not unnaturally, caused some concern in certain agricultural circles, who fear that, as a result of the development of the movement towards better nutrition and the increase in consumption of the protective foods, there will be a continuous shrinkage in the demand for cereals.

The Mixed Committee has examined this question at some length and has come to the conclusion that an all-round improvement in nutritional standards would result in a considerable increase in the total world demand for high-grade cereals, and this for several

reasons. As has already been stated in paragraph 6 above, the energy-bearing foods remain the basis of the dietary: as nutrition improves, these will be supplemented and by no means displaced by the protective foods. Moreover, it is clear that the first and most urgent aim of nutrition policy must be to do away with under-nourishment in the absolute sense—*i.e.*, deficiency of calories—where it exists; this unquestionably involves increased consumption by a considerable number of people in various countries of the foods of high energy value, notably cereals. It is a well-established fact that persons suffering from a serious deficiency of calories are not able to derive full benefit from the high nutritive properties of the protective foods. Furthermore, in certain Far-Eastern and other countries, a qualitative improvement in diet would probably take the form, in the first instance, of the substitution of a cereal more compatible with health, such as wheat, for those of lower nutritive value, such as maize and rice. In view of the large populations and the extent of under-nourishment in these countries, this factor may be expected to play an important rôle in the development of the demand for higher-grade cereals as purchasing power gradually increases. Finally, in so far as improved nutrition in Western countries entails a greater consumption of foods of animal origin, it also involves an increased demand for cereals for use as animal feeding-stuffs.

10. These considerations should be borne in mind in reading the paragraphs which follow, and, in particular, it should not be supposed that, because a reduced *per caput* consumption of certain foods has resulted from the improvement in consumption habits in certain classes in some countries, the total demand for these foods would fall with a worldwide improvement in nutritional standards.

Cereals.

11. Cereals constitute the principal source of energy in the world's diet and for centuries have been the staple food of the great Asiatic and Mediterranean civilisation.¹ The relative importance of the different cereals in the various parts of the world depends upon conditions determining production, on price, purchasing power,

¹ See F. C. KELLY: "Wheat", a report prepared for the Wheat Advisory Committee (mimeographed, London, 1936).

custom and taste. In Asia, rice remains, along with millet, the basis of the diet; yield in calories per acre is high and rice is the preferred cereal of the population. Elsewhere, wheat has gradually gained supremacy. Wheat, at one time the bread only of the wealthy, has been increasingly demanded by the lower-income groups of the population as their standard of living improved. It has replaced coarse grains, such as rye, oats and barley.

In the United Kingdom, this change was fully effected in the nineteenth century; in most other Western countries, it began later than in the United Kingdom and was effected more gradually. It was, of course, hastened by the import of cheap wheat in large quantities from non-European countries in the last quarter of the nineteenth century and by the introduction of new and more productive methods of cultivation in Europe to meet this competition. These developments not only caused a shift from other cereals to wheat, but also released purchasing-power for increased consumption of other foods. To-day the trend in Europe is almost universally away from the other cereals to wheat, but rye is still important in a group of countries in Central, Eastern and North-Eastern Europe (Germany, Austria, Czechoslovakia, Poland, the Scandinavian and the Baltic States) and maize is extensively used in certain countries of South-Eastern Europe (particularly Yugoslavia and Roumania) and in parts of the United States of America.

12. The Food Research Institute of Stanford University has made the following estimate of post-war changes in the *per caput* utilisation of the three principal food cereals in the world as a whole, excluding Russia:

Table I.

"WORLD" *Per Caput* UTILISATION OF PRINCIPAL BREAD CEREALS 1909-1914
AND 1923-1933.^a

	Kilogrammes		Change	
	1909/10 to 1913/14	1923/24 to 1932/33	Units	Percentages
Wheat	97.16	93.62	— 3.54	— 3.6
Rye	30.21	23.95	— 6.26	— 20.7
Rice	49.26	42.73	— 6.53	— 13.3
Total . . .	176.63	160.30	— 16.33	— 9.2

^a Taken from "Wheat Studies of the Food Research Institute", Vol. XII, No. 10: "World Wheat Utilisation since 1885/86", by M. K. BENNETT (Stanford University, California, 1936). Figures are given in bushels of 60 lb. in the original; converted into kilogrammes at the rate of 1 lb. = 0.4536 kg. (1 kg. = 2.2 lb.).

The figures refer to total utilisation, including seed and animal feed as well as human food. The compiler of the figures is of opinion that the *per caput* animal-feed use of wheat and rye together “almost certainly increased between pre-war and post-war years”, while *per caput* seed use cannot have changed appreciably; he estimates that the fall in the world average *per caput* human-food use of all three cereals may well have exceeded 10%.

13. Many reasons go to explain this decline in the average *per caput* food use of cereals in post-war years. The most important is undoubtedly the general rise in the standard of living. Cereals are a relatively cheap food, and as incomes rise they tend to be replaced in the diet by more expensive foods:¹ the net result is a greater diversification in the diet. Propaganda favouring greater consumption of the so-called “protective” foods has been another influence operating in the same direction. With the increasing mechanisation of industry, less muscular energy is expended and the need for concentrated foods of high energy value has been reduced. Moreover, as will be shown in detail below, sugar has directly and successfully competed with cereals as a source of energy. Other commodities (for example, milk and fats) have competed indirectly; and the ordinary bread in use in some Western countries now contains a higher proportion of milk and of fats, as well as of sugar, than was the case a generation ago.

14. The absolute decline in the food use of bread cereals would appear to have been greatest in the countries where the great bulk of the cereal consumption consists of wheat. These are, in general, the countries with the highest levels of living; as incomes rose, there was a partial substitution of more expensive non-cereal foods for wheat. In countries where rye or maize was the principal cereal, there has, on the other hand, been a tendency towards their displacement by wheat. The relative importance of cereals and of wheat in the national diet of certain countries before the war is illustrated in the following table:

¹ For detailed evidence on this point, see Diagram II in Chapter 5 below.

Table II.

WHEAT AND OTHER CEREALS IN DIET OF CERTAIN COUNTRIES
BEFORE THE WAR.^a

Country	Percentage of total calories derived from cereals	Percentage of total calories derived from wheat	Percentage of wheat in total cereals
United States	34	26	75
United Kingdom	35	31	89
Germany	39	16	40
France	55	50	91
Italy	64	47	73
Russia	73	19	26
Japan	87	6	7

^a Figures apply to the years just before the war and were secured from compilations carried out during the war, largely for the purpose of determining the basis of rationing. Data are taken from "Wheat Studies of the Food Research Institute", Vol. V, No. 4: "The Place of Wheat in the Diet" (Stanford University, California, 1929). Post-war figures of the percentage of total calories derived from cereals would in all cases be lower than those shown above.

The pre- and post-war tendencies in the *per caput* food use of wheat in the country where wheat accounted for the bulk of cereal intake before the war are given in Table III below.

Table III.

Per Caput WHEAT CONSUMPTION.^a

	1894-1899	1909-1914 Kilogrammes	1929-1934
France	216.4	219.6	190.0
Italy	126.3	162.2	171.2
British Isles	151.3	153.2	134.7
U.S.A.	145.6	140.2	100.2

^a Based on "Wheat Studies of the Food Research Institute", Vol. XI, No. 7, and Vol. XII, No. 10. Given in bushels of 60 lb. in the original; converted into kilogrammes at the rate of 1 lb. = 0.4536 kg. (1 kg. = 2.2 lb.).

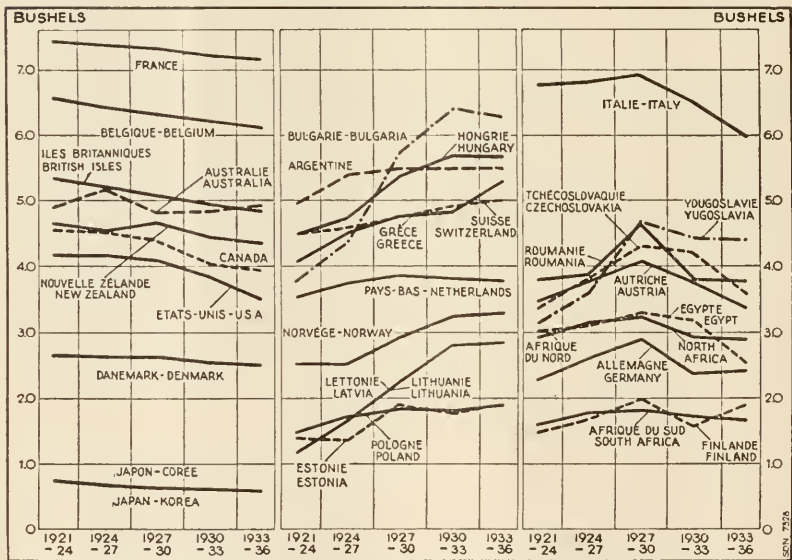
The fall in the food use of wheat was already in progress in the United States before the war. Between the end of the century and the most recent period shown, average consumption fell by about a third. At the same time, the *per caput* consumption of cornflour, the only other cereal at all widely used in the United States, fell even more sharply (from 47 kg. in 1899 to 9 kg. in 1927).

Total cereal consumption, which is estimated ¹ to have provided 1,500 calories per head daily in 1899, does not now provide much more than 850 calories per head per day. In the United Kingdom, the tendency is in the same direction, though not quite so marked. A recent study ² suggests that the proportion of total calories derived from cereals fell from about 35%—as shown in Table II—before the war to 30% in 1924-1928.

15. Post-war tendencies in the *per caput* consumption of wheat in certain countries are shown in Diagram I below: ³

Diagram I.

Per Caput FOOD USE OF WHEAT IN VARIOUS COUNTRIES.



¹ Based on "Wheat Studies of the Food Research Institute", Vol. V, No. 4.

² A. W. FLUX: "Our Food Supply before and after the War", in *Journal of the Royal Statistical Society*, 1930. It should be noted that the pre-war figures relate to Great Britain and Ireland and the post-war figures to Great Britain and Northern Ireland. The exclusion of the Irish Free State from the post-war figures would tend to invalidate the comparison with the pre-war figures to whatever extent the food habits of the inhabitants of the Irish Free State differ from those of the inhabitants of the rest of the British Isles. As, however, the population of the Irish Free State in 1924-1928 averaged about 3 million persons, compared with over 45 millions in Great Britain and Northern Ireland, it is clear that differences in food habits of considerable magnitude would be needed to affect the averages seriously.

³ Diagram taken from "Wheat Studies of the Food Research Institute", Vol. XII, No. 10.

To attempt to interpret each of these curves would be beyond the scope of the Mixed Committee's task. It may, however, be pointed out that the countries in the first group, which include all with a consistent downward trend, are—with the exception of Denmark and Japan—countries where wheat is the preferred cereal and—with the possible exception of Japan—countries with high levels of real income. Hence it is reasonable to suppose that the decline in wheat consumption represents either a decline in total calorie intake per head or the displacement of wheat by other (perhaps more highly protective) foods.

The second group, consisting of those in which *per caput* consumption either rose continuously or rose and then remained fairly stable, includes certain Northern and Eastern European countries in which rye is the staple cereal; it is likely that the rise in wheat consumption represents largely the displacement of rye.

The third group consists of countries where *per caput* wheat consumption rose up to 1930 and fell thereafter. In most of these, another cereal is still largely used: rye in Finland, Germany, Austria and Czechoslovakia, and maize in Roumania and Yugoslavia. The increase in average wheat consumption in the earlier years of the post-war period probably represents chiefly the displacement of other cereals, and the subsequent decline, a retreat to the cheaper cereals owing to the depression.

16. The trend movements in the human consumption of cereals other than wheat have already been dealt with to some extent by implication in the preceding paragraphs, and, in default of adequate statistical material, it is difficult to add much to the facts already stated. In most countries of Northern, Central and Eastern Europe, there appears to be a secular tendency for wheat-bread to replace rye-bread: Table I above shows a much greater decline in the average *per caput* utilisation of rye than of wheat. In these countries, however, as well as in Western Europe and the United States, it seems likely that the average *per caput* consumption of all bread cereals has tended to decline, rye consumption falling off by more than wheat consumption rose. Unfortunately, the statistics of the fodder use of rye and maize in countries where these cereals are widely used for human consumption are in most cases too defective to enable this supposition to be put to the test

of rigid statistical verification. For Germany, however, statistics are available which show a declining total bread consumption and an increasing share of wheat in the aggregate. The following table shows the use of flour per head of the German population during the years indicated:

Table IV.

Per Caput USE OF WHEAT FLOUR AND RYE FLOUR IN GERMANY.^a

	Rye flour		Wheat flour		Total flour
	Kg.	%	Kg.	%	Kg.
1912/13	65.4	54	56.3	46	121.7
1924/25	58.1	53	50.7	47	108.8
1927/28	49.3	47	54.6	53	103.9

^a Taken from *Berichte über Landwirtschaft*, Vol. 27: "Umstellung des deutschen Getreidebaus" (Berlin, 1930).

In Finland, where rye is used almost exclusively for human consumption, the *per caput* utilisation fell from about 175 to about 125 kg. between 1909-1913 and 1926-1928, while the *per caput* utilisation of wheat rose from 40 to 50 kg. In Denmark and Norway, the *per caput* utilisation of rye for all purposes fell during this period by more than that of wheat increased, while, in Sweden, wheat appears to have gained about as much as rye lost. Almost all the countries for which data are available show a smaller *per caput* utilisation of rye for all purposes in recent years than before the war. In view of the general increase in animal husbandry, it is probable that the greater part of this decline was due to a falling-off of human consumption.

17. In Europe, maize is extensively used as the principal bread cereal of part of the population only in Roumania, Yugoslavia and parts of Bulgaria, Czechoslovakia, Hungary, Italy and Poland. The use of maize inadequately supplemented by foods supplying nutrients in which it is deficient has been shown to be the cause of pellagra—a serious disease. In Italy, this disease was very widespread at the beginning of this century, but an extensive public health campaign has been successful in reducing the death rate from pellagra from 10.7 per 100,000 in 1900 to 0.2 per 100,000 in

1928.¹ The campaign included propaganda against excessive maize consumption and against its production under conditions which do not permit it to ripen completely, the prohibition of the sale of "spoiled" maize and the establishment of rural bakeries and soup-kitchens with the object of supplying a nutritious diet including wheat bread.

As the maize eaten by the rural population is also produced by them, no accurate records of consumption are available and it is not possible to measure exactly the trend of consumption for the parts of the populations concerned. The tendency for wheat consumption to rise in these countries does, however, make it appear likely that maize consumption has been reduced, and this supposition is confirmed by such partial indications as are available. According to figures supplied by the Roumanian Union of Agricultural Chambers, the average consumption of polenta, or maize bread, fell from about 140 kg. per head in the Old Kingdom before 1916 to about 68 kg. per head in 1936.

Maize is also extensively eaten in certain parts of the United States.² The efforts to combat pellagra in regions where this is the principal cereal have been directed principally to supplementing the maize diet with yeast, milk and lean meat, and not to replacing maize with another cereal.

Sugar.

18. The decline in the use of cereals in most Western countries during the present century has been associated with a remarkable rise in the consumption of sugar. Sugar is exclusively a fuel food: it is completely free of fat, protein, vitamins or mineral elements. It is valued chiefly for its ease of assimilation, its taste and for the flavours it imparts to other foods. The substitution of sugar for cereals as a source of energy thus involves a loss of valuable nutritive properties; on the other hand, the rise in the consumption of sugar is partly due to increased use of fruit, which is richer in these properties than cereals.

¹ W. R. AYKROYD: "Pellagra", in "Nutrition Abstracts and Reviews", Vol. 3, 1933.

² See also Chapter 7, paragraph 8.

19. The increase in the consumption of sugar during the past century is one of the most remarkable changes in food habits which have occurred, and illustrates perhaps better than any other single index the rise in the standard of comfort. Sugar has been extracted from cane from very early times, but it was not until the end of the eighteenth century that the process of manufacturing sugar from the juice of the sugar-beet was discovered. In Europe, the sugar-beet industry was first established in France with State assistance under Napoleon; everywhere it has been fostered by Governments. World production of beet sugar is estimated to have increased from 3.8 million tons in 1893/94 to 8.9 million tons in 1913/14 and 11.5 million tons in 1930/31. The increased competition of sugar-beet led to very important technical improvements in the cane-sugar industry and world production of cane sugar rose from 9.8 million tons in 1893/94 to 19.6 and 29.2 million tons in the two later campaign years mentioned above.¹

It is a noteworthy fact that up to the present the desire of the State to assure large domestic supplies of foods of prime necessity has resulted principally in the encouragement of the production of foods of high energy value, notably cereals and sugar. As a result of these developments, the sugar changed, in countries with a high standard of living, from a luxury enjoyed only by the wealthy to a necessity of life even for the lowest income groups of the population. In 1821, the people of the United States consumed 3.6 kg. of sugar per head; by the middle of the century the amount had risen to 13.6 kg.; in 1900 it was 30.2 and in 1928 over 47 kg. per head. Average consumption in the United Kingdom is estimated to have quintupled in the course of the past century; in France, average *per caput* consumption increased from 1.33 kg. in 1817-1821 to about 11 kg. at the beginning of the century and 20 kg. in 1920-1930; and in Germany it rose from 3 kg. per head in 1850 to nearly 14 kg. in 1900.

20. The trend of *per caput* consumption during the present century is illustrated in Table V.

¹ Estimates of Dr. Gustav MIKUSCH, Vienna.

Table V.^a

Per Caput SUGAR CONSUMPTION IN VARIOUS COUNTRIES.

	Kg. of raw sugar		
	1900/01	1913/14	1928/29
Denmark	23.4	45.7	56.1
U.S.A.	30.3	37.7	54.0
England	44.5	42.4	45.9
Switzerland	24.3	32.2	43.1
Sweden	17.9	26.0	39.9
Netherlands	20.1	22.8	31.0
Belgium	10.7	15.1	27.9
France	16.6	21.9	24.6
Germany	13.9	21.1	26.1
Austria	8.1	12.9	31.1
Czechoslovakia			28.0
Hungary			13.5
Russia	6.5	11.5	9.0
Poland			13.5
Spain	4.5	6.7	12.8
Italy	2.8	5.3	9.7
Yugoslavia	...	...	5.5 ^b

^a Taken from *Berichte über Landwirtschaft*, Vol. 40: "Die Deutsche Zuckerwirtschaft" (Berlin, 1931).

^b Figure furnished by Dr. E. MARKOVIC, member of the Mixed Committee.

21. The great increase and high level of sugar consumption in certain countries have caused some concern to students of the physiological aspects of nutrition.¹ The Health Organisation of the League of Nations will shortly proceed to consultation and study designed to determine the amount of sugar consumption which must be regarded as excessive. At the same time, an examination of Table V shows a wide range of sugar consumption in different countries; and there is no reason to doubt that in many parts of the world there is scope for a considerable increase in the consumption of this food.

Meat.

22. Meat is valuable as a source of tissue-forming protein and of iron, and is also valued on account of its appetising and stimulating properties. The glandular tissues—liver, sweetbread, kidneys—are highly nutritious, particularly as regards the character of the protein and the mineral and vitamin content.

¹ See League of Nations: "The Problem of Nutrition", Vol. II — "The Physiological Bases of Nutrition": "The increasing habit in certain countries of large sugar consumption tends to lessen the amount of protective foods in the diet and is to be regarded with concern".

23. The production of meat is widely distributed throughout the world; indeed, meat is second only in importance to wheat as a staple food. World trade is confined within relatively narrow limits. The trade in beef and mutton is largely a movement from the southern to the northern hemisphere, while world trade in pig meat is largely confined to the northern hemisphere. The movement of meat from Europe is entirely dependent upon refrigeration: chilling or freezing. The Argentine Republic is by far the most important exporter of beef, with Australia, Uruguay and New Zealand following. The depletion of European live-stock during the war resulted in an increase in the relative importance of foreign supplies in European consumption; but European herds have grown considerably in the past ten years and the volume of beef entering international trade has declined. On the other hand, there was an increase in the trade in mutton and pig meat up to 1931. New Zealand is the principal exporter of mutton and lamb, followed by Australia and the Argentine Republic, while Denmark is the main exporter of pig meat. The United Kingdom is the principal market for imported meats of all kinds and, in addition, imports live cattle from the Irish Free State.

24. No clear trend in total meat consumption can be discerned on the basis of the available statistical material. Table VI below compares the average *per caput* consumption of certain meats in a number of countries in 1909-1913 and 1925.

Table VI.

ESTIMATED ANNUAL *Per Caput* CONSUMPTION OF CERTAIN MEATS,
1909-1913 AND 1925.^a

	Kilogrammes ^b							
	Beef and veal		Lamb and mutton		Pig meat		Total meat	
	1909-1913	1925	1909-1913	1925	1909-1913	1925	1909-1913	1925
New Zealand . . .	63.5	85.3	65.3	34.9	—	—	—	—
United Kingdom . .	29.9	32.7	14.1	12.2	15.0	19.1	59.0	64.0
United States . . .	31.8	32.2	3.2	2.3	28.1	30.8	63.0	65.3
Germany	16.8	17.2	0.9	0.9	31.3	25.9	49.0	44.0
Belgium	14.1	20.4	0.9	0.5	—	15.4	—	36.3
Netherlands	14.1	15.4	—	—	—	—	—	—

^a Data are taken from Imperial Economic Committee "Cattle and Beef Survey" (London, 1934) and "Mutton and Lamb Survey" (London, 1935).

^b Given in pounds in the original; converted into kilogrammes at the rate of 1 lb. = 0.4536 kg.

The figures for the United Kingdom and the United States suggest that total meat consumption was somewhat higher in 1925 than before the war. It was lower in Germany; but it will be seen from the table given in the following paragraph that the pre-war level had been reached again by 1929. Consumption of meat in France has been estimated ¹ at 27 kg. per head in 1909 and 34 kg. per head in 1929.

25. For more recent years more complete estimates (in some cases very rough) of meat consumption are available. These are summarised in Table VII below:

Table VII.

ESTIMATED ANNUAL *Per Caput* CONSUMPTION OF MEAT (IN KILOGRAMMES)
1925-1929 AND 1930-1934.^a

	Total meat		Beef and veal		Mutton and lamb		Pork, bacon and lard	
	1925-1929	1930-1934	1925-1929	1930-1934	1925-1929	1930-1934	1925-1929	1930-1934
New Zealand . . .	106.7 ^b	103.6 ^b	60.3 ^b	53.9	35.8	41.8	10.5	8.7
Australia	107.2	91.5	69.0	46.2	30.0	37.3	8.2	8.0
Canada	69.1	65.3	30.9	27.5	2.8	3.1	35.4	34.7
United Kingdom . .	62.4	63.7	31.5	29.1	12.3	13.9	18.6	20.7
United States ^c . .	62.1	61.2	24.0	23.6	2.7	3.2	35.4	35.4
Denmark	47.0	52.4	21.9	26.4	—	—	25.1	36.0
Germany	49.8	51.0	17.1	16.1	0.8	0.6	31.9	34.3
Switzerland	44.7	47.2	25.6	25.5	0.7	0.6	18.8	21.1
Netherlands	42.5	45.6	20.0	17.9	0.4	0.5	22.1	27.2
Belgium	38.3	40.8	19.3	17.9	2.7	2.4	16.3	20.5
Sweden	38.7	36.1	19.0	14.0	0.7	1.1	19.0	21.0
Norway	31.0	33.1	14.4	14.7	5.5	5.4	11.1	13.0
Czechoslovakia . .	34.2	33.3	13.3	12.5	3.4	3.3	17.5	17.5
France	40.3	39.0	23.5	20.9	3.0	2.6	13.8	15.5
Poland	18.0	18.7	6.9	7.3	0.3	0.2	10.8	11.2
Italy	18.9	16.3	11.8	9.8	1.6	1.3	5.5	5.2

^a League of Nations: "The Problem of Nutrition", Vol. IV — "Statistics of Food Production, Consumption and Prices" (revised by the International Institute of Agriculture on the basis of information and modifications received from Governments).

^b Veal not included.

^c The figures for the United States are not revised. Revised figures for federally inspected meats only (representing about 60 to 70% of the total) have been received, and are as follows:

	1925-1929 Kg.	1930-1934 Kg.
Beef and veal	20.2	17.8
Mutton and lamb	1.9	2.4
Pork, bacon and lard	25.8	25.5
Total	47.9	45.7

¹ By the Office des Renseignements agricoles.

Perhaps the most striking feature of this table is the extremely wide range in the estimated meat consumption of different countries. To take but two examples, it is estimated that in 1930-1934 average meat consumption was almost seven times greater in New Zealand than in Italy and twice as high in the United Kingdom as in France.

26. To a greater extent than is the case of many other foods, statistics of the average *per caput* consumption of meat are likely to conceal large differences in the consumption of different sections of the population. This is true also of the figures showing *changes* in *per caput* consumption. For example, a comparison of Tables VI and VII above suggests that total meat consumption per head in the United Kingdom, the United States and Germany (the three countries for which pre-war figures are available) changed but little between 1909-1913 and 1930-1934. It seems highly probable that this virtual stability in average meat consumption results from the fact that certain sections of the population which formerly ate little or no meat have, in post-war years, greatly increased their meat consumption, while other sections of the population, which formerly ate meat to excess, reduced theirs.

27. Changes in the consumption of individual meats are much more marked than changes in the consumption of meat as a whole. The consumption of the individual meats in the different countries appears to depend largely on conditions of production, and (as is shown in some detail in Chapter 4 below) relatively small changes in price cause considerable shifts in demand. These shifts represent the substitution of the cheaper for the more expensive meats: the demand for meat as a whole does not show great flexibility. In the post-war period, there was, in most countries, a switch from beef consumption to mutton and pork, but in certain cases these tendencies have been reversed in recent years.

Fish.

28. Sea foods are especially valuable on account of their iodine content, which is greater than that of land plants or the flesh of land animals. The demonstration of the unique qualities of fish oils as a source of vitamins A and D suggests the importance of fat fish

in the diet.¹ The outstanding fat fish are salmon, shad, herring, butterfish and mackerel.

In particular, the value of the high content of fat-soluble vitamins in the livers of some fish is becoming increasingly recognised. But there is still much scope for the expansion of preparations of these substances—particularly from the livers of halibut and tunny-fish, where the necessary vitamins are highly concentrated.

29. Such statistics of fish production and consumption as are available disclose no very marked trend movement. For the United Kingdom, the average *per caput* consumption has been estimated at about 18.1 kg. a year in 1909-1913 and the same in 1924-1928.² This is a much higher figure than in the United States, France or Germany. For the United States, consumption in post-war years would appear to have averaged no higher than 6.8 kg. per head.³ In Germany, average *per caput* fish consumption rose from 8.4 kg. a year in 1909-1913 to 9.5 kg. a year in 1930-1931.⁴ Consumption in France in 1927-1934 fluctuated between 7.5 and 8.2 kg. per head per year; in Italy, consumption is about 5 kg.; in Switzerland, only 2.7-3 kg.; and in Denmark, about 11.3 kg.

30. It is difficult to resist the conclusion that there is scope for a large increase in fish consumption. In recent years, considerable progress has been made in fishing methods, particularly through the substitution of mechanically propelled craft for sailing vessels and the application of wireless telegraphy to trawlers. Improvements in the technique of canning, refrigeration and drying extend the area of consumption and compensate in some degree for the irregular nature of the catch of this highly perishable food. Methods of refrigeration have improved remarkably during the past twenty years and, as a result of research work at present in progress, further improvements may be confidently expected. Progress has also been made in marketing methods, but much remains to be done in

¹ McCOLLUM and SIMMONDS: "The Newer Knowledge of Nutrition" (4th ed., New York, 1929).

² A. W. FLUX, *op. cit.*

³ U.S. Department of Commerce, Domestic Commerce Series, No. 38 — "Apparent *Per Capita* Consumption of Principal Foodstuffs in the United States" (Washington, 1930).

⁴ *Berichte über Landwirtschaft*, Vol. 88 — "Deutschlands Nahrungs- und Futtermittelversorgung" (Berlin, 1933).

this direction. In particular, transporting the inedible portions of fish frequently adds unnecessarily to costs on retail markets, and in many countries the retail price of fish seems very high when compared with the price received for the catch and with the relationship between retail and wholesale prices of other foods. This is no doubt also partly due to the instability of wholesale prices resulting from the irregularity of the supply. The retailer tends to protect himself by fixing the retail price at a point at which he is covered against severe rises in wholesale prices.

Poultry and Eggs.

31. Statistics of poultry consumption are difficult to obtain and are of doubtful reliability, on account of the widespread practice of poultry-keeping among cottagers in all countries. There has been a marked increase in the number of specialised poultry farms since 1900, and it is not open to doubt that in most countries the consumption of poultry has tended to rise in post-war years. The amounts received at four great urban markets in the United States rose from 97 million kg. in 1920 to nearly 181 million kg. in 1931 and, though it declined in subsequent years, still amounted to nearly 136 million kg. in 1935. Consumption per head is estimated at 5.9 to 6.4 kg. In Germany, poultry consumption is estimated to have risen from 1.2 kg. *per caput* in 1925 to 1.8 kg. in 1930 and to have remained at 1.6 kg. thereafter. In Switzerland, consumption of poultry was estimated at 1.1 kg. per head in 1921, 2 kg. per head in 1932 and 1.9 kg. per head in 1934. In the United Kingdom, the consumption of poultry rose steadily from 1.5 kg. per head in 1925 to 2.3 kg. per head in 1934. In Canada, where the consumption of poultry has long been relatively high, the same tendency is apparent—consumption rising from 4.3 kg. per head in 1925 to 5 kg. in 1930 and to 8.4 in 1936.

32. Eggs are a food of special merit; not only are they high in energy value, but they are an important source of "good" protein, minerals (especially iron) and certain vitamins. It is therefore satisfactory to be able to record that there has been a marked upward tendency in the consumption of eggs in recent years. This is illustrated in the following table of estimated annual consumption per head:

Table VIII.

ESTIMATED ANNUAL *Per Caput* CONSUMPTION OF EGGS.^a

	1925-1929	1930-1934
Canada	295 ^b	285 ^b
Belgium	241	236
United States	251 ^c	252 ^c
United Kingdom	149	172
Switzerland	126	157
France	123	149
Germany	124	129
Italy	112	119
Sweden	90	110
Austria	93	98
Denmark	98	111

^a From League of Nations: "The Problem of Nutrition", Vol. IV — "Statistics of Food Production, Consumption and Prices", documentation prepared by the International Institute of Agriculture (Geneva, 1936).

^b Gross figures (no deduction for eggs intended for incubation, wastage, etc.).

^c Figures corrected by U.S. Department of Agriculture.

The only countries included in the above table which did not share in the upward trend of recent years are Canada and Belgium; in these countries, egg consumption was already very high in the earlier period.

Dairy Products.

33. Milk is the nearest approach we possess to a complete food. It contains all the materials essential for the growth and maintenance of life in a form readily assimilable by the body: the energy-giving nutrients (protein, fat and carbohydrate); all the known essential vitamins; calcium, phosphates and other minerals salts. Experiments carried out on animals and observations of the effect of milk consumption on the growth of children and health of children and adults have established beyond any doubt its very high nutritive qualities. Of the milk products, cheese retains the proteins of milk and a large proportion of the calcium salts and vitamins; butter retains the fat-soluble vitamins of milk and is the most digestible and generally nutritious fat in the modern dietary. Separated or skim milk retains all the constituents of milk except

fat and is therefore rich in protein, calcium, phosphorus and the water-soluble vitamins.

34. The valuable nutritive properties of milk have been known from early times and there has been a steady expansion in the production and consumption of milk, so that to-day the cash value of the world's production of milk exceeds the cash value of any other farm crop.

During the past fifty years there has been a worldwide increase in the production of milk. The growth of dairying has, indeed, been one of the most remarkable features of recent world agricultural development, and the upward trend of milk production has been accentuated during the past decade. The increase in output has far exceeded the growth in population and has coincided with well-considered efforts in many countries to direct public attention to the special nutritive virtues of milk and other dairy products. At the same time, in many parts of the world, public control and inspection have resulted in higher standards of cleanliness and a greater assurance of safety in the consumption of whole milk. As a result of all these causes, there has been a marked and general increase in the consumption of milk and milk products since at least the beginning of the present century.

35. It is not possible to say what proportion of world milk production is consumed in liquid form and what proportion in the form of butter, cheese, etc. It is generally assumed that rather more than half is consumed as whole milk, though the proportion naturally varies widely from country to country. The statistics of consumption of dairy products as a whole leave much to be desired, but they show clearly that the broad trend of consumption has been upward.

For the United Kingdom, total supplies of all dairy produce are estimated¹ to have increased from 5,200 to 5,500 metric tons (in terms of fluid milk) between 1909-1913 and 1924-1928; dairy produce accounted for nearly 20% total calorie intake (about 600 calories per head per day) in the latter period, compared with 16% (less than 500 calories per head per day) in the earlier period. Slightly less than half the dairy-product calories

¹ A. W. FLUX, *op. cit.*

of the latter period were derived from whole milk, slightly more than half from butter and cheese and a small amount from condensed milk. For Germany, the daily *per caput* consumption of dairy products is estimated ¹ to have yielded 515 calories in 1909-1913 and 541 calories in 1931-1932. In the United States, the average *per caput* consumption of dairy products is estimated ² to have increased from 363 to 408 kg. (in terms of whole milk) at the end of the nineteenth century to 455 kg. in 1926. PEARL estimated ³ that, in the years 1911-1916, 15 % of the energy value of the food eaten by the American people was derived from dairy products and the proportion in post-war years must be considerably higher.

36. According to the most recent statistics,⁴ the average *per caput* consumption of liquid milk in the United States rose steadily from 144 litres in 1923 to 154 litres in 1929 and fell back somewhat in subsequent years.

The statistical data relating to liquid milk consumption in the United Kingdom are unsatisfactory. The Linlithgow Commission, reporting in 1923, expressed the opinion that the consumption of milk had almost doubled within the previous forty years. As total population increased by 46 % during this period, this would involve an average increase of about a third in *per caput* consumption. According to an unofficial estimate,⁵ consumption per head in Great Britain rose by 33 % between 1890 and 1907/8, or at the rate of 1.8 % per annum; and by an average of just under 1 % a year since 1924/25, to 100 litres in 1930/31. Consumption per head, therefore, appears to have increased less rapidly after than before the war; the figure of 100 litres per head is about two-thirds of the American and one-third of the Finnish consumption. This slackening in the rate of growth of consumption of liquid milk after the war is no doubt partly connected with the relatively high retail price of milk. In the year ending September 1931, the retail price of milk was nearly 75 % above the pre-war level, while the cost-of-living index was 50 % higher and the average retail prices of foods other than milk 30 % higher.

¹ *Berichte über Landwirtschaft*, Vol. 89, *op. cit.*

² U.S. Department of Commerce, *op. cit.*

³ Raymond PEARL: "The Nation's Food" (Philadelphia and London, 1920).

⁴ Supplied by the U. S. Department of Agriculture.

⁵ Ruth L. COHEN, "The History of Milk Prices" (Oxford, 1936).

It must also be borne in mind that milk has not been generally regarded as a food in the United Kingdom, but as an adjunct to other foods. In recent years, steps have, however, been taken to popularise the consumption of whole milk as a beverage, and there are now several hundred milk-bars in London alone.

The trend of milk consumption is also upwards in France, though the average remains very low in that country. In recent years, "champagne-milk" (full milk, carbonised and flavoured with fruit-juice) has been consumed in considerable quantities and the consumption of yoghurt is increasing rapidly. Propaganda in favour of whole-milk consumption has made great headway in certain countries of Northern Europe. In the Netherlands, for example, the institution of the milk-bar has become increasingly popular during the past few years, and the consumption of milk and cream per head has been roughly estimated to have risen from 77 litres in 1930 to 145 litres in 1932 and 127 litres in 1934. In Latvia, the consumption of milk and dairy products increased by 30% between 1930 and 1935, while population rose by only 2½%. In Denmark, where the high nutritive properties of milk have also been extensively advertised, the consumption is estimated to have risen from 100 litres per head in 1926 to 186 litres in 1934. No figures are available of the total consumption of liquid milk in Finland, but family budget enquiries conducted there in 1928 showed that town workers and their families consumed as much as 282 litres per head. In Sweden, the figure in 1932/33 was over 136 litres per head.

37. The fresh milk consumed in the world is largely of domestic production; but during the past fifty years—and particularly during the past decade—there has been a remarkable expansion in the international trade in butter and cheese.

38. The post-war development of the international trade in butter is briefly summarised below. The figures relate to exports.

Table IX.
WORLD EXPORTS OF BUTTER.

In thousands of quintals.			
1909-1913 (average) . .	3,251	1932	5,508
1924-1928 (average) . .	4,585	1933	5,590
1929	5,121	1934	5,920
1930	5,336	1935	6,041
1931	5,753		

World exports of butter were almost twice as high in 1925 as in the pre-war quinquennium. This increase was largely directed to the British market, where imports (which had already doubled ¹ in the last fourteen years of the nineteenth century) rose from a yearly average of about 2,032,080 quintals just before the war to about 2,870,000 quintals in 1924-1926, 3,175,000 quintals in 1929 and 4,826,200 quintals in 1935. *Per caput* consumption must have increased very rapidly in the years preceding the war. Consumption was officially estimated ² at 6.9 kg. per head in 1907 and 7.4 kg. per head in 1925; the figure rose steadily to 8.0 kg. in 1929 and 11.4 kg. in 1935.

In the United States, which is the world's largest butter producer, butter consumption appears to have remained, on the whole, fairly stable at about 8 kg. per head for at least the last twenty-five years.

Germany is the largest European producer of butter and the second largest importer in the world. Production was greatly increased after the war and butter consumption per head, according to a private estimate,³ rose from about 6.2 kg. before the war to 7.6 kg. in 1927. This latter estimate may be high, but the available statistics leave no doubt that the tendency of consumption was distinctly upwards after 1925.

39. The pre- and post-war *per caput* consumption of butter in a large number of countries has been privately estimated and, without subscribing to the accuracy of the figures given, it is of interest to examine the tendency they reveal:

Table X.

PRE- AND POST-WAR ANNUAL *Per Caput* CONSUMPTION OF BUTTER.^a

	Kg. per head			Kg. per head	
	Pre-war	Post-war		Pre-war	Post-war
Canada	12.6	13.6	Denmark	8.0	5.7
Australia	11.6	13.4	Switzerland	5.5	5.4
United Kingdom	7.7	8.2	Netherlands	7.6	5.1
United States	7.7	8.0	France	3.9	4.0
Germany	6.7	7.6	Russia	2.3	2.6
Sweden	7.5	7.2	Italy	1.1	1.0

^a *Berichte über Landwirtschaft*, Vol. 22 — "Weltproduktion und Welthandel der Molkereierzeugnisse" (Berlin, 1930).

¹ From 1,500,000 to 3,300,000 cwt. between 1886 and 1900.

² Report of the Imperial Economic Committee on Dairy Produce (London, 1926-1936).

³ *Berichte über Landwirtschaft*, Vol. 22 — "Weltproduktion und Welthandel der Molkereierzeugnisse" (Berlin, 1930).

The post-war figures relate to 1927. The only countries to show a marked decline in *per caput* butter consumption are Denmark and the Netherlands, where the consumption of margarine has considerably increased. In most other countries there was a fairly well-marked increase in butter consumption. The tendency of consumption during the past decade is shown in the following table:

Table XI.

ESTIMATED *Per Caput* CONSUMPTION OF BUTTER SINCE 1925.^a

	1925 Kg.	1929 Kg.	1932 Kg.	1935 Kg.
New Zealand	15.1	16.3	16.3	18.1
Irish Free State	...	17.8	...	18.8 ^b
Canada	12.4	13.3	13.8	14.0
Australia	13.0	13.4	13.1	14.1 ^b
United Kingdom	7.2	8.0	9.8	11.4
Denmark	5.6	5.9	8.5	9.4
Belgium	...	7.8	10.4	8.2
United States	8.0	7.9	8.2	7.8
Germany	5.2	7.6	7.4	7.5
Switzerland	5.0 ^c	5.8	6.5	6.9
Netherlands	5.6	5.9	8.2	6.3
France	4.4	5.1	6.1	5.8
Italy	1.2 ^d	1.0	1.1	1.2 ^b

^a League of Nations: "The Problem of Nutrition", Vol. IV — "Statistics of Food Production, Consumption and Prices", documentation prepared by the International Institute of Agriculture (revised) (Geneva, 1936). Given in pounds in the original; converted into kilogrammes at the rate of 1 lb. = 0.4536 kg. The figures for 1935 are taken from "Dairy Produce", Imperial Economic Committee, London, 1936.

^b 1934.

^c 1921.

^d 1926.

A general upward trend is clearly apparent from the above table. The only significant exceptions are recent declines in Belgium and the Netherlands.

The decline in consumption in these countries is, in all likelihood, largely due to the growing industrialisation of butter manufacture. So long as butter remained a cottage industry, the small farmer consumed some part of what he produced. With the growth of specialised dairies, however—a development which undoubtedly brought great benefits to the industrial population—the farmers of many countries frequently tended to give up entirely the home manufacture of butter, sell almost all their liquid milk, and buy margarine instead of butter for their own use because it is cheaper.

40. The consumption of cheese has tended to increase slightly in most countries during the past decade:

Table XII.

ESTIMATED *Per Caput* CONSUMPTION OF CHEESE.^a

	1925-29 Kg.	1930-34 Kg.		1925-29 Kg.	1930-34 Kg.
Switzerland	9.9	8.4	United Kingdom	—	4.3
Netherlands	5.1	6.3	New Zealand	2.0	3.5
Germany	5.0	6.0	Belgium	2.8 ^b	2.9
France	5.1	5.7	U.S.A.	2.1	2.1
Denmark	5.2	5.8	Australia	1.7	1.8
Italy	4.6 ^c	4.8	Canada	1.6	1.6

^a League of Nations: "The Problem of Nutrition", Vol. IV — "Statistics of Food Production, Consumption and Prices", documentation prepared and revised by the International Institute of Agriculture.

Given in pounds in the original; converted into kilogrammes at the rate of 1 lb. = 0.4536 kg.

^b 1929.

^c 1926-1929.

Vegetable Oils.

41. At least thirty different trees and plants have been used to produce oil on a commercial scale. Of the vegetable oils used for human consumption, olive oil, cottonseed oil, linseed oil, coconut oil, corn oil, palm-kernel oil, soya-bean oil and ground-nut oil are among the most important. In recent years, sunflower seed has become of increasing importance. The special dietary property of the vegetable oils lies in their very high energy value; they do not contain vitamins and mineral matter.

42. Statistics of the production of the various oilseeds and nuts are too incomplete to enable the trends in production to be measured accurately; and as a large but unknown part of production is used for purposes other than human consumption—such as in the manufacture of soap and for industrial purposes—it is, as a rule, impossible to trace the trends in human consumption.¹ Production of many of the oilseeds and nuts is high in Asia and Africa and olive oil is extensively produced and consumed in the Mediterranean countries. The principal import markets for oilseeds are France, Germany, the Netherlands and Italy, and the United Kingdom, United States and Japan are also important markets. The crushed seed, etc., which is left when the oil is extracted from the seed or

¹ See Imperial Economic Committee — "Vegetable Oils and Oilseeds" (London, 1936).

plant is a very important by-product, the oil cake or meal serving as food for live-stock or as fertiliser.

43. The total utilisation of vegetable oils has increased remarkably during the past thirty years and, from such fragmentary indications as are available, it would seem likely that the human consumption has also risen in most Western countries. Vegetable oils have tended to some extent to displace animal fats as shortenings and cooking fats. As early as the 1880's, lard was adulterated with cottonseed oil, and later lard substitutes were manufactured from oleostearin and cottonseed oil, and more recently the process of hydrogenation has enabled solid and tasteless cooking-fats to be produced from cottonseed, maize, soya-bean and other oils alone. Moreover, the increasing use of salads and fruits, to which reference is made below, has also involved an increase in the use of salad oil, chiefly olive oil and also refined, deodorised and decolorised cottonseed oil.¹

44. Vegetable oils are consumed as such mainly in the form of olive oil, which is widely used in the Mediterranean countries, and margarine, which is extensively used in most parts of the world as a butter substitute. The composition, and in consequence the dietary value, of margarine is different in different countries. The general tendency seems to be to increase the proportion of vegetable matter and reduce the proportion of animal matter used in its manufacture.² Thus, in the United States, packing-house fats were more important than vegetable fats until 1919, but since then the reverse has been true; coconut oil and cottonseed oil predominate. In Belgium, Denmark, Germany, the United Kingdom and the Netherlands, vegetable oils are also a more important constituent of margarine than are animal oils; in Northern Europe, however, there has been a tendency in recent years to make greater use of whale oil and other marine oils, but these still remain relatively unimportant. In the United Kingdom, the Netherlands, Norway and some other countries, the manufacturers of margarine have, latterly, produced margarine containing the vitamin A and vitamin D equivalent of butter.

¹ See "Recent Economic Changes", Vol. I (New York, 1929).

² See Katherine SNODGRASS: "Margarine as a Butter Substitute" (No. 4 of Fats and Oils Studies of Food Research Institute, Stanford University, California, U.S.A.).

45. The following table shows the post-war changes in *per caput* consumption of margarine in several countries:

Table XIII.
ESTIMATED *Per Caput* CONSUMPTION OF MARGARINE.^a

	1913 Kg.	1924 Kg.	1926 Kg.	1930 Kg.	1936 Kg.
Denmark	15.0	20.7	22.5	22.8	19.5
Norway	10.9	16.0	17.5		
Netherlands	2.0	7.1	8.5	8.9	5.4
Germany	3.6	5.6	6.5	7.9	5.6
Sweden	4.5	5.6	6.0		
United Kingdom	3.5	5.4	6.0		
Belgium	1.5	3.4	4.5	5.4	4.2
France	0.4	0.7	1.0		
United States	0.7	1.0	1.0	1.2	0.9 ^b

^a The figures for 1913, 1924 and 1926 are taken from U.S. Department of Agriculture, "Foreign Crops and Markets", May 14th, 1928. Those for 1930 and 1936 are from official national sources.

^b 1933.

There is a large range of variation in the consumption of margarine in different countries. Consumption is exceptionally high in Denmark, where it rose from 1 kg. per head in 1888 to 11½ kg. per head in 1908 and 22½ kg. per head in 1930. Part of the post-war increase was at the expense of butter, as is shown in Table IX above, but, none the less, average butter consumption in Denmark remained quite high in comparison with that in neighbouring countries. The total consumption of fat in Denmark is remarkable high; the fact that this is composed to so large an extent of margarine must be largely attributed to the special structure of the agricultural system. The skim-milk by-product of the dairy industry is used as feed for the pigs, and in addition vegetable oilseeds are imported in large quantities. The oil is used (along with skim milk) to manufacture margarine and the oilcake is used as animal feed. In recent years, vitamin-A deficiency has been observed in Denmark and certain circles have aimed at increasing the home consumption of butter.

Margarine consumption is also high in Norway, where the dairying industry is not very extensive; the margarine used in this country is vitaminised. It is also considerable in the Netherlands, a dairying country, where the consumption of butter is not high. Similar factors to those mentioned for Denmark operate here; much of the oilseed imported comes from the Netherlands Indies. Of the other countries included in Table XII, special reference need be made

only to France and the United States, where consumption is very low. In certain parts of France, olive oil is extensively used as such and other vegetable oils are largely used in cooking. The consumption of butter is relatively low. Margarine is used chiefly as a cooking-fat rather than a spread. The low consumption may be due in part to the legislation against colouring.

46. The relationship between butter consumption and margarine consumption is an interesting and important subject worthy of more detailed analysis than it has hitherto received. It has been shown above that, during the past generation, the consumption of both has increased in several countries; it would appear, therefore, that the demand for edible fats is elastic in terms of income and *per caput* consumption tends to rise with increasing wealth. The type of fat used appears to depend upon conditions of production and upon purchasing power in relation to the relative prices of the various substitutes. The price of butter is of particular importance; when it fell in recent years, there was in most countries a considerable substitution of butter for the less nutritive margarine.¹

Vegetables.

47. Recent nutrition teaching has attached special importance to increasing the consumption of vegetables, particularly green leafy vegetables, such as spinach, cabbage, salads, etc. They are rich in the B vitamins and in vitamin A, and are among the most important sources of the anti-scorbutic vitamin C; they are very rich in important minerals.

48. Estimates of vegetable production and consumption are notoriously unreliable. Even where the area under vegetables is known, the yields vary a great deal from year to year, so that estimates of output based on area are subject to an unusually wide margin of error. Moreover, the recorded statistics of area under vegetables generally exclude kitchen-gardens; in the case of vegetables, a small plot of ground intensively cultivated has a very large yield, so that the omission is important. Under the

¹ Compare the recent movement of butter and margarine consumption shown in Table X and XII above. See also Chapter 5, Table XVI, below. In the United Kingdom between 1924 and 1934, margarine consumption fell by one-third, while butter consumption increased by 57%; these movements coincided with a fall in the price of butter of 48% (cf. ORR: "Food, Health and Income", page 18).

pressure of necessity during the war, the practice of keeping vegetable gardens in villages and even cities as well as on farms was stimulated in almost all countries. This practice survived after the war (although the growing urbanisation of certain countries has, perhaps, tended to limit its importance) and undoubtedly resulted in an improvement in the quality of the diet.

49. After making all necessary allowances for the imperfection of the statistics, there remains no doubt that, since the war, there has been a very large increase in the consumption of vegetables in all Western countries. The nutritive qualities of this food have been increasingly recognised. Production has tended to become more specialised, qualities have been standardised, transport facilities improved and marketing better organised. In addition, these factors, together with the development of particularly early- and late-maturing strains, have contributed much towards the reduction of seasonal fluctuations in the consumption of vegetables. Special mention must be made of the work of the Producers' and Consumers' Co-operative Organisations in improving the quality of fruit and vegetables marketed. ¹ In all these fields, however, much remains to be done, as will be shown later.

50. A few examples may be quoted to illustrate the recent increase in the consumption of vegetables. In the United States, figures are available for car-lot shipments of the principal vegetable crops by years since 1920. These figures do not include shipments by motor, which have become increasingly important, so that they probably understate the rate of increase of consumption.

Table XIV.

CAR-LOT SHIPMENTS OF VEGETABLES IN THE UNITED STATES.^a

	Snapbeans	Carrots	Celery	Cucumbers	Lettuce
1920	1,473	1,602	10,859	3,689	13,788
1925	5,133	3,427	20,514	8,492	36,509
1930	9,559	12,392	25,490	7,663	55,718
1935	10,076	12,384	19,111	5,279	45,669
	Onions	Green Peas	Potatoes	Spinach	Tomatoes
1920	29,473	—	185,176	2,891	18,394
1925	30,796	2,707 ^b	241,523	7,919	28,254
1930	40,281	7,294	252,411	9,636	33,578
1935	30,467	7,966	201,893	5,606	23,318

^a Taken from U.S. Department of Agriculture Year-Books of Agriculture and Agricultural Statistics.
^b 1926.

¹ International Labour Office: "The Co-operative Movement and Better Nutrition". Studies and Reports, Series B, No. 24. Geneva, 1937.

The annual *per caput* consumption of vegetables other than potatoes is estimated ¹ to have risen from 58 kg. in 1919/20-1923/24 to 69 kg. in 1934/35, while the consumption of potatoes fell slightly. In the United Kingdom, the consumption of fresh vegetables other than potatoes is estimated ² to have risen from 27.2 kg. per head in 1909-1913 to 35.4 kg. in 1924-1928 and 44.5 kg. in 1934; consumption of potatoes shows little net change. The consumption of fresh vegetables other than potatoes was estimated ³ at nearly 54 kg. *per caput* in Germany in 1927, and about 43 kg. *per caput* for the city population. For the post-war period, there was a significant increase in the consumption of tomatoes, lettuce, cauliflower and cucumbers; on the other hand, consumption of cabbage shows no increase and consumption of potatoes a slight decline. In France, as in other countries, there has been an increase in the variety of vegetables consumed. Tomatoes have become increasingly popular, endives are cultivated as well as imported in large quantities and more beans are eaten than before the war. In some of these countries (and no doubt the same is true for others for which statistics are not available), vegetables have come to be used less as a source of energy than as a source of refreshment. This explains in part the increase in consumption of tomatoes, lettuce, celery and cucumbers, and the decline or stability in the consumption of potatoes and other bulky vegetables. It is worthy of note that the vegetables whose consumption has increased most require little, if any, time in cooking, which has no doubt been an additional factor in popularising their use, particularly where the housewife is also a wage-earner. The growth of the canning industry has also played an important part in this connection.

Fruit.

51. One of the most remarkable and encouraging changes in consumption habits since the beginning of this century is the very large increase in the use of fruit. The significance of this develop-

¹ U.S. Dept. of Agriculture, Bureau of Agricultural Economics: "Looking Forward on Agricultural Policy" (Washington, 1936).

² A. W. FLUX, *op. cit.*; and J. B. ORR: "Food, Health and Income" (London, 1936).

³ *Berichte über Landwirtschaft*, Vol. 69 — "Gemüse, Obst und Südfrüchte im Deutschen Reich", by Dr. Ludwig SAMUEL (Berlin, 1933).

ment from a nutritional standpoint is scarcely to be overrated. Along with milk and vegetables, certain fruits rank high in the list of protective foods, being important sources of vitamins and mineral elements.

52. The increased consumption of the citrus and other sub-tropical fruits is especially striking. The high medicinal value of the lemon has long been known; its antiscorbutic qualities were responsible for the provision in the British Merchant Shipping Act (1867) requiring ships sailing for countries where lemon or lemon-juice is not available to carry enough lemon-juice to provide each member of the crew with 1 oz. per day. The orange was introduced into South-Western Europe much later than the lemon and its cultivation lagged much behind. International trade in oranges developed later than that in lemons, only beginning towards the middle of the nineteenth century; the grapefruit was practically unknown until the present century.

53. The following table shows the world trade in citrus fruits and in bananas in 1928-1930, compared with before the war:

Table XV.

WORLD TRADE IN CITRUS FRUITS AND BANANAS.^a

Yearly average	Oranges and mandarines	Lemons	Other citrus fruits	All citrus fruits	Bananas
In thousands of quintals					
1909-1913	8,079	2,735	17	10,831	9,553
1928-1930	13,634	2,774	504	16,891	21,044

^a Taken from *Berichte über Landwirtschaft*, Vol. 68 — "Weltproduktion und Welthandel an frischen Südfrüchten", by RITTER and GUTTFELD (Berlin, 1933).

The statistics for individual countries show that the consumption of sub-tropical fruits has increased most, and is highest, in the United States of America, the British Dominions, the United Kingdom and the countries of Western Europe.¹ The development in the United States is shown in the following table:²

¹ The consumption of oranges and tangerines is also relatively high in Japan.

² Taken from U. S. Department of Commerce, Domestic Commerce Series, No. 38: "Apparent *Per Capita* Consumption of Principal Foods in the United States" (Washington, 1930).

Given in pounds in the original; converted into kilogrammes at the rate of 1 lb. = 0.4536 kg.

Table XVI.

Per Caput CONSUMPTION OF CITRUS FRUITS AND BANANAS
IN THE UNITED STATES.

	1899 Kg.	1909 Kg.	1926 Kg.
Oranges	3.0	6.5	9.8
Lemons	1.4	1.8	2.4
Grapefruit	—	0.4	2.5
Bananas	5.7	9.2	10.4

The large increase in the consumption of the citrus fruits went hand in hand with an educational campaign of the medical profession and extensive advertising on the part of the distributors. In the United Kingdom, the same tendency is apparent, as is shown in the following figures of imports:

Table XVII.

IMPORTS OF CITRUS FRUITS AND BANANAS
INTO UNITED KINGDOM.^a

	1909-1913	1924-1928	1929-1933	1935
		In thousands of tons		
Oranges	283	389	508	513
Grapefruit	—	13	36	60
Lemon and other citrus fruits	43	62	75	67
Bananas	102	190	240	305

^a Data from Imperial Economic Committee: "Fruit Supplies in 1935" (London, 1936).

Changes in German imports of oranges, lemons and bananas since before the war are shown below.

Table XVIII.

IMPORTS OF CITRUS FRUITS AND BANANAS INTO GERMANY.^a

	1911-1913	1930-1932	1933-1935
	In thousands of tons		
Oranges	137	284	254
Lemons	37	72	69
Bananas	36	112	86

^a Data from Imperial Economic Committee: "Fruit Supplies in 1935" (London, 1936)

In spite of the decline during quite recent years, orange and lemon imports were nearly twice as great in the last period shown, and banana imports more than twice as great as before the war. Examples of the same tendency could be multiplied. Thus, the average *per capita* consumption of oranges in the Netherlands rose from 2.6 kg. (including mandarines) in 1902-1906 to 9.35 kg. (excluding mandarines) in 1933; and of lemons, from 0.54 to 0.91 kg.¹ In 1913, Sweden imported 6.25 million kg. of oranges; in 1929, she imported 15.5 million kg. and, in 1934, 34.8 million kg. Imports of bananas rose from 1.15 million kg. in 1913 to 13.3 million kg. in 1929, and then fell back to 7.3 million kg. in 1934. Belgian imports of exotic fruits, which had already risen from 12,000 to 31,000 tons between 1900 and 1913, amounted to 60,000 tons in 1929 and 117,000 in 1931. In recent years, the French consumption of citrus fruits has also increased remarkably; since 1929, imports of oranges have more than doubled.

Table XIX.

IMPORTS OF CITRUS FRUITS AND BANANAS INTO FRANCE.^a

	1929	1932 In thousands of tons	1935
Oranges	103	198	222
Mandarines	26	39	40
Lemons	19	24	29
Bananas.	126	221	152

^a Data from Imperial Economic Committee: "Fruit Supplies in 1935" (London, 1936).

54. The underlying strength of the tendency towards greater consumption of citrus fruits in Western and Central Europe is shown in the fact that, in most countries, the movement continued even after the economic depression set in in 1929. The estimated *per capita* consumption of citrus fruits and bananas² in 1925-1929 and 1930-1934 is shown below.

¹ Data from "Jaarcijfers voor Nederland" issued by Centraal Bureau voor de Statistiek.

² The dietetic value of citrus fruits and bananas is not identical; they are, however, frequently not separated in trade statistics and are therefore grouped together in Table XX.

Table XX.

ESTIMATED *Per Caput* CONSUMPTION OF CITRUS FRUITS
AND BANANAS.^a

	1925-1929 Kg.	1930-1934 Kg.
United Kingdom	15.6	19.4
Belgium	5.4	12.5
Netherlands	8.9	12.9
France	5.7	11.5
Switzerland	6.7	10.7
Norway	7.2	9.5
Sweden	4.0	6.9
Germany	5.5	7.0
Denmark	4.3	5.5
Czechoslovakia	2.1	3.1

^a Data from League of Nations: "The Problem of Nutrition", Vol. IV — "Statistics of Food Production, Consumption and Prices", documentation prepared and revised by International Institute of Agriculture (Geneva, 1936).

Given in pounds in the original; converted into kilogrammes at the rate of 1 lb. = 0.4536 kg.

55. Consumption of citrus fruits and bananas is very much smaller in the countries of Eastern and South-Eastern Europe. In Poland, where there was for many years an import prohibition on oranges, consumption of citrus fruits and bananas was only 0.6 kg. per head per year in 1925-1929 and 0.5 kg. in 1930-1934. In Yugoslavia, the consumption of citrus fruits and bananas was 0.8 kg. in 1925-1929 and 0.7 kg. in 1930-1934. The Union of Soviet Socialist Republics imports practically no southern fruits. In these countries, as well as in Lithuania and Bulgaria, the consumption of lemons (chiefly as an adjunct to tea) is as high as, or higher than, the consumption of oranges.

56. In the great majority of countries, the increase in the consumption of citrus fruits in recent years has not taken place at the expense of other fresh fruit. On the contrary, there is every indication that the consumption of fresh fruit has also risen markedly and perhaps over an even wider area. Unfortunately, with the statistics at present available,¹ it is not possible to make an

¹ Few countries publish annual figures of fruit production, and for those that do so it is impossible to determine to what extent the figures include fruit grown in private gardens, whether attached to farmhouses or private dwelling-houses. Moreover, the task of estimating fruit consumption is complicated by the utilisation of wine grapes for consumption as fruit and by the practice of distilling or drying other fruits, especially plums. Figures of apple and pear production may include cider fruit to an unknown extent.

accurate estimate of the *per caput* fruit consumption in a large number of countries; it is to be hoped that improvements will be effected in this respect in the near future. The upward trend is, however, unmistakable. During the past decade, there has been a strong development of interest in fruit-growing and an increase in almost all the countries in the amount of land under orchard. In addition, even in those few countries where aggregate production has not increased (or, perhaps better, where no increase is recorded in the official statistics), there has been a considerable increase in the production of commercially marketable fruit. In addition to the growth of farm orchards, there has been a marked development of commercial orchards in many countries; the trees have been more carefully tended; varieties have been adapted to modern marketing requirements and the average level of quality has been much improved.

57. The fact that the average *per caput* consumption of fresh fruit has increased substantially during the present generation forms so striking a part of ordinary experience that it hardly requires the confirmation of statistical evidence. In the next chapter, figures are given to show the large increase in the production of fruit in recent years. For the present, it will suffice to quote a few typical examples of changes in *per caput* consumption.

Thus, in Great Britain and Northern Ireland, the total supplies of fruit available for consumption (not including cottage-garden produce and consumption on farms) was 1,864,000 metric tons in 1924-1928 compared with 1,271,000 metric tons in Great Britain and Ireland in 1909-1913.¹ As the population was the same in the two periods,² this represents an apparent rise of nearly 50% in *per caput* consumption—from 27.7 kg. to 41.3 kg. per head. The available statistics³ suggest a further increase of the consumption of fresh fruit of more than 15% between 1924-1928 and 1934. In the United States, although to some extent at the expense of apple consumption, the consumption of other fresh fruit increased from about

¹ Data from A. W. FLUX: "Our Food Supply before and after the War" in *Journal of Royal Statistical Society*, 1930.

² It should be noted that the pre-war figures relate to Great Britain and Ireland and the post-war figures to Great Britain and Northern Ireland, thus excluding the Irish Free State. See footnote ² on page 106 above.

³ Imperial Economic Committee: "Memoranda on Fruit Supplies".

23 kg. per head at the beginning of the century to nearly 45 kg. per annum in 1923-1927.¹ The consumption of grapes in France has doubled within the past ten years and the consumption of other fresh fruit rose from 3 to 4 million quintals in 1913 to over 10 million quintals in 1935. Consumption per head of fresh fruit in France is to-day two or three times as high as before the war. In Italy, the consumption of fresh fruit other than citrus fruit, which was privately estimated ² at 16 kg. per head in 1910-1914, is officially estimated ³ at 28 kg. per head in 1926-1930 and 38 kg. per head in 1931-1934. The pre-war figures are not directly comparable with the more recent ones, but there seems little doubt that the upward trend disclosed since 1926 was already under way before that year.

58. Not only have people been eating more fruit in recent years than formerly, but they have also been able to spread their increased consumption more evenly throughout the year. This partial elimination of seasonal fluctuations in fruit consumption represents distinct progress towards better nutrition. It has been accomplished through an extension of the area from which fruit supplies are drawn, through development of the technique of refrigeration and the speed of transport and through the growth of the canning industry. It must be observed, however, that preservation by the ordinary canning process generally eliminates the ascorbic acid (vitamin C) found in fresh fruit; but this fact, if recognised by the manufacturers, can be overcome by the addition of synthetic ascorbic acid.

One example will be sufficient to show the importance of new sources of supply in reducing seasonal variations in fruit consumption. Twenty-five years ago, it was virtually impossible to buy oranges in Europe between the end of April and the beginning of December; to-day, with the extension of cultivation to the southern hemisphere, they are obtainable the whole year round. Hitherto the United Kingdom has been the chief European market for summer oranges. In 1935, for example, that country imported 40% of her total imports of oranges during the seven-month period from May to November, while France imported 25% of her total imports and Germany less than 10% of hers during these months.

¹ U.S. Department of Commerce, *loc. cit.*

² Estimate of Dr. Lorenzo SPINA quoted in *Annuario Statistico Italiano*, 1935.

³ *Annuario Statistico Italiano*, 1936.

C. GENERAL SUMMARY OF CONSUMPTION TRENDS.

59. The principal facts which emerge from the preceding detailed analysis can be briefly summarised. In all Western countries, the average diet of the population has become increasingly diversified during recent decades. There has been a tendency (stronger in some countries than others, but everywhere present) for the consumption of dairy products, eggs, fruit and vegetables to increase; and the great staples, such as cereals and potatoes, have come to constitute a smaller proportion of human foodstuffs. The fact that a larger proportion of total calorie requirements has been derived from the highly protective foods represents a great nutritional advance and shows that there is a natural tendency on the part of consumers to act upon their better knowledge of the importance of rational nutrition so far as economic circumstances permit. The only important tendency disclosed in the detailed analysis which can be regarded as an exception to this general statement is the increasing consumption of sugar in certain countries where the level of consumption is very high.

60. Figures relating to the average consumption of the entire population are, of course, not necessarily typical for different income and population groups. It is shown in Chapter 5 that there are very wide differences in the consumption of certain foods by families with different incomes per head. These differences are necessarily concealed in a national average. The true significance of an average figure differs considerably for the various products; it is greater, for example, for cereals and potatoes than for meat, vegetables and other protective foods, the consumption of which is known to be much higher in families of high incomes than in those where means are restricted.

61. The data available, however, suggest that all classes have shared in the general improvement in dietary habits. A few examples will illustrate the improvement in workers' diets. A study¹ has recently been made of the food habits of relatively small groups of

¹ Medical Research Council, Special Report Series, No. 218: "A Dietary Survey in Terms of the Actual Foodstuffs consumed", by E. P. CATHCART and A. M. T. MURRAY (London, 1936).

working-class families in Glasgow in 1911 and 1933; average income per head was about the same in the two periods, account being taken of the rise in the cost of living. In 1933, three-quarters of the families ate fresh fruit, while none did in 1911. In 1933, three-quarters of the families ate leafy vegetables, while less than half did in 1911. More families also ate eggs in the later year, but, on the other hand, consumption of fresh milk fell and butter tended to be displaced by margarine.

A more satisfactory comparison of working-class diets in different periods can be made for Belgium, where various official budgetary studies have been carried out since before the end of the last century. According to these surveys,¹ the average monthly consumption of an adult male ² has changed as follows:

Table XXI.

EVOLUTION OF FOOD CONSUMPTION OF FAMILIES OF MANUAL WORKERS
IN BELGIUM.

(Consumption per adult male per month.)

	1891 Kg.	1910 Kg.	1921 Kg.	1929 Kg.	1929 as % of 1891
Beef	1.84	1.51	2.12 ^c	1.83	99.5
Pork	0.20	0.85	0.73	0.68	338.6
Bacon	0.41	0.76	0.69	0.64	154.8
Fat	0.32	0.95	0.78	0.47	147.2
Eggs	0.37	0.65	1.09	0.84	255.1
Milk	3.95	6.91 ^a	9.29	12.09	318.1
Butter	1.27	1.38	1.87 ^d	1.91	149.7
Bread	21.29	20.22	19.52	16.73	78.5
Potatoes	19.33	21.80	21.48	18.72	96.8
Coffee	0.45	0.59	0.72	0.57	126.1
Chicory	0.45	0.44	0.62	0.48	108.8
Sugar	0.20	0.50 ^b	1.50	1.25	620.8

^a Whole milk.

^b Lump sugar.

^c Fresh and frozen meat.

^d Butter and margarine.

¹ See Max GOTTSCHALK: "Budgets ouvriers en 1891 et en 1929", in *Revue sociologique*, 1931, and the "Purchasing Power of Belgian Workers", in *International Labour Review*, June 1932.

² For the scale of nutritive requirements according to age and sex used in these studies, see Chapter 5, page 241, scale *b* (1 adult male = 3.5 consumption units).

The most notable trends (apart from the remarkable increase in sugar consumption) are the continuous rise in the consumption of milk, butter and eggs, the steady fall in bread consumption and the post-war decline in the consumption of potatoes. Figures available for food expenditure show that the percentage spent on vegetables other than potatoes doubled between 1891 and 1929 (from 2.4 to 4.8%) and that considerable amounts were spent on fruit in 1929, while none reached the worker's table in 1891. In considering these figures (and those given later in this paragraph), it should be borne in mind that 1929 (and the preceding years) represent a period of relative prosperity, when it might be expected that workers would be in a position to buy unusually large amounts of the higher-priced foods. There appears, however, little reason to doubt that the principal changes shown do indeed reflect genuine long-run changes in food-consumption habits. For the superior diet of 1929, the Belgian worker had to pay out a smaller fraction of his total income than his father paid in 1891. The relative increase in the consumption of the protective foods was particularly striking for the workers with the lowest incomes, though the absolute amount of their consumption remained, of course, lower than that of the better-paid workers.

Recent trends in food habits of industrial workers in Sweden are illustrated in the following figures, which show the annual consumption per consumption unit ¹ of families covered by the budgetary enquiries of 1914, 1923 and 1933:

Table XXII.

EVOLUTION OF FOOD CONSUMPTION OF MANUAL WORKERS IN SWEDEN.

(Consumption per consumption unit per year.)

		1914	1923	1933
Meat	kg.	25.9	27.3	27.7
Full milk	litres	196.2	254.2	225.1
Skim milk.	litres	68.3	18.1	7.9
Butter	kg.	9.6	11.1	11.7
Margarine	kg.	6.2	6.4	10.9
Eggs	number	134.2	189.1	241.5
Bread, flour, etc.	kg.	135.3	124.5	100.5
Potatoes	kg.	94.5	117.2	105.2
Sugar	kg.	25.5	30.3	36.5

¹ For scale used in computing consumption units, see page 241, scale *d*.

Attention is especially directed to the steady increase in the consumption of eggs and butter. The consumption of full milk was very much higher in 1923 than in 1914, but fell somewhat in the next decade. Figures for fruit and vegetable consumption are not available, but there is no doubt that much larger quantities of these foods are eaten now than before the war.

Official budgetary enquiries conducted among the working population of Oslo before and after the war give the following data for annual consumption per consumption unit:¹

Table XXIII.

EVOLUTION OF FOOD CONSUMPTION OF MANUAL WORKERS IN NORWAY.

(Consumption per consumption unit per year.)

		1912/13	1927/28
Meat	kg.	36.2	55.6
Fish	kg.	24.9	53.0
Full milk	litres	86.5	158.3
Skim milk.	litres	103.6	33.8
Butter	kg.	7.6	3.5
Margarine	kg.	14.5	23.7
Eggs	kg.	4.8	11.5
Bread, flour, etc.	kg.	162.3	135.7
Potatoes	kg.	79.5	98.8
Other vegetables	kg.	9.4	20.6
Fresh domestic fruit	kg.	2.8	3.8
Oranges, etc.	kg.	4.2	12.2
Sugar	kg.	20.4	25.4

The superiority of the post-war diet is apparent; especially noteworthy is the large increase in the consumption of full milk, eggs, vegetables other than potatoes and southern fruit.

The average daily consumption of industrial workers² in Germany before and after the war has been estimated³ as follows:

¹ For scale used in computing consumption units, see page 245, scale *d*.

² For scale used in computing consumption units, see page 245, scale *k*.

³ From Carl von Tyska: "Ernährung und Lebenshaltung des Deutschen Volkes" (Berlin, 1934).

Table XXIV.

EVOLUTION OF FOOD CONSUMPTION OF MANUAL WORKERS
IN GERMANY.

(Consumption per adult male per day.)

		1907/8	1927/28
Meat	grammes	90-100	126
Milk	litre	$\frac{1}{3}$ - $\frac{1}{2}$	$\frac{1}{2}$
Butter	grammes	30	16
Other fats.	grammes	10-15	39
Eggs	number	$\frac{1}{3}$ - $\frac{1}{2}$	$\frac{1}{2}$
Cheese	grammes	10-15	13
Fish	grammes	—	18
Bread	grammes	450	307
Potatoes	grammes	500	421
Vegetables.	grammes	—	85
Sugar	grammes	...	45
Calories		2,900-3,500	2,866

The pre-war figures are stated to be less reliable than those for 1927/28, which are taken from the official budgetary enquiry. Apart from the fall in butter consumption, the changes which are suggested by the above table are in the direction of a more varied and better balanced diet.

62. It is clear, from the examples given in the preceding paragraph (which do nothing more than confirm the evidence of general observation and experience), that the average diet of the urban working-classes of Western countries has tended, in post-war years, to include larger amounts of the "protective" foods. The same is undoubtedly true of Western agricultural communities. Thus, there has been a substantial rise in the meat consumption of agricultural labourers in France and the United Kingdom since the war, and this increase is but one aspect of an all-round improvement in the dietary. In Belgium, at the beginning of the present century, workers lived largely on bread and potatoes; only very small quantities of meat and butter were eaten and little or no fruit or vegetables. To-day, meat is eaten at least once a day, butter twice a day and vegetables daily.¹ According to the farm

¹ DELOS: "Traité d'économie rurale" (Brussels, 1934).

accounts furnished to the Swiss Peasants Union, consumption on farm households shows considerable changes since before the war: milk consumption per "adult male" rose from 422 litres in 1911 to 475 litres in 1932; meat consumption from 53 to 64 kg.; and the consumption of potatoes fell from 277 to 224 kg. In Sweden, official studies of the food habits of agricultural workers carried out in 1920 and 1933 gave the following data on annual consumption per "normal household" (3.3 consumption units)¹:

Table XXV.

EVOLUTION OF FOOD CONSUMPTION OF AGRICULTURAL WORKERS
IN SWEDEN.

(Consumption per normal household per year.)

		1920	1933
Meat	kg.	89.2	98.8
Herrings	kg.	28.4	15.5
Whole milk	litres	866.6	895.2
Skim milk.	litres	440.6	234.3
Butter	kg.	25.7	23.2
Margarine	kg.	6.6	33.4
Cheese	kg.	5.0	14.6
Eggs	number	264	535
Bread, flour, etc.	kg.	562.0	508.5
Potatoes	kg.	597.3	568.5
Coffee.	kg.	16.2	17.6
Sugar	kg.	80.5	120.9

63. Accurate statistical data regarding the food-consumption habits of the salaried and professional groups are not readily available, but there is no doubt that, during recent decades, increasing attention has been paid to the nutritive properties of different foods and the diet has become better balanced and more rational. An interesting illustration of the effect which the spread of knowledge concerning the correct principles of nutrition can have on food habits is provided in a recent survey² of the diet of school-boys at Christ's Hospital, an English boarding-school, at different dates. The consumption of different foods per boy per day in 1913 and 1932 is shown below.

¹ For scale used in computing consumption units, see page 245, scale *d*.

² FRIEND and SCHULTZ: "The School-boy" (London, 1935).

Table XXVI.

EVOLUTION OF FOOD CONSUMPTION IN AN ENGLISH
BOARDING-SCHOOL.

(Consumption per boy per day.) ^a		
	1913 Kg.	1932 Kg.
Bread	0.370	0.270
Jam, sugar, syrup	0.054	0.112
Fresh vegetables and fruit	0.070	0.150
Meat (fresh)	0.170	0.161
Corned beef	—	0.016
Bacon	0.022	0.016
Sausages	0.013	0.013
Fish	0.037	0.039
Fish-cake	—	0.012
Meat-pie	—	0.009
Eggs	—	0.003
Milk (pints)	0.152	0.337
Butter	0.035	0.040
Cheese	0.006	0.006

^a Given in pounds in the original; converted into kilogrammes at the rate of 1 lb. = 0.4536 kg.

The outstanding features of this comparison are the increased stress placed on the consumption of milk and fresh fruit and vegetables, and the consequent decline in bread consumption. The 1932 diet is more varied than the pre-war diet and richer in all the essential nutritive elements.

64. It is, perhaps, worth observing at this point that, if the preceding analysis makes it clear that the diet of most Western countries has improved very considerably during the past twenty or thirty years, and if it shows that consumption habits have been tending to change along the right lines, it affords nevertheless no grounds for complacency. Evidence is adduced later in this report to show that, even in those countries where the improvement in dietary habits has been most marked, the diet of a substantial portion of the population remains deficient in essential nutritive elements. A problem of malnutrition unquestionably exists even in the countries of highest general planes of living, and in others less fortunately placed the evil is more widespread.

65. The examples quoted in the preceding discussion of consumption trends have been largely drawn from the United States,

the British Empire, and the States of Western and North-Western Europe; little has been said about the trend of consumption in Central or Eastern Europe. The statistical data relating to these countries are too incomplete to permit of any generalisations.

From such partial indications as are available, it would seem that (in the towns, at any rate), the trend of consumption is broadly similar to that observed in Western countries—namely, towards a greater consumption of fresh fruit, vegetables and dairy products. Thus, in Latvia, the *per caput* consumption of milk and dairy products increased by nearly 30% between 1930 and 1935; alcohol consumption has fallen very notably. The *per caput* consumption of eggs increased by nearly two-thirds between 1929 and 1934. The number of fruit-trees is constantly increasing and so also is the cultivation of vegetables, particularly greenhouse vegetables (tomatoes, green salads, lettuce, radishes, etc.), in the neighbourhood of Riga. The same tendencies appear to prevail in the other Baltic States.

In Poland, the consumption of milk and milk products, though still low, appears to be increasing; it is estimated to have risen from 182 litres per head in 1927-1929 to 227 litres in 1930-1934. In Roumania, the consumption of eggs is estimated to have risen from about 80 per head in 1926/27 to 110 per head in 1933; the rise was partly due to the loss of export markets. The number of fruit-trees has grown in recent years, and the production of vegetables increased by nearly a third between 1927 and 1933. Natural conditions for these crops are favourable and there is reason to believe that great progress could be made along these lines.

In Yugoslavia, the area under fruit (other than plums) and vine and under vegetables has been tending to expand. Statistics available for Zagreb suggest that, during the past quinquennium, there has been a slight but noticeable increase in *per caput* consumption of fruit and vegetables in that city; it is believed that, through educational means, the production and consumption of these foods by the population in country districts could be greatly increased. In Bulgaria, a successful attempt has been made to encourage fruit cultivation, and the area under fruit has increased remarkably during the past decade. The area under vegetables has also increased and *per caput* consumption appears to have risen by about 50%. At the same time, the consumption of meat in the principal towns has shown an upward movement.

66. The figures quoted in the preceding paragraph must, however, be treated with reserve. In these countries, the peasants constitute the bulk of the population and live on what they produce themselves. What is consumed on the farms frequently escapes the recorded production statistics. Rural habits of consumption change less rapidly than urban. They are more dependent on local production, and the food consumed in country districts is often less varied, less refined and more bulky than that consumed in the towns. Generally, one or at most two staples constitute the bulk of the diet; and, when economic circumstances permit, an increase in consumption is directed in the first instance towards more of the same foods rather than towards different foods.

The problem of influencing the food habits of the bulk of the population of the peasant States of Europe is therefore different from that encountered in Western countries.

D. FACTORS DETERMINING OBSERVED TRENDS IN FOOD-CONSUMPTION HABITS.

67. The changing content of the diet of Western countries is not an accident; it corresponds to a genuine change both in physiological requirements and in the power to satisfy them. The principal cause of this change is the reduction in the expenditure of muscular energy brought about, on the one hand, by the increased mechanisation of industry and agriculture and the reduction in hours of work and, on the other hand, by the rise in the proportion of the population engaged in commerce, trade, clerical work and other quasi-sedentary occupations. Simultaneously this mechanisation of production has increased output per head and raised the purchasing power of all classes of the population.

68. By and large, labourers doing heavy manual work obviously spend more energy than do machine-tenders or office-workers; the energy spent in work must be provided by food, and it is natural that the substitution of machinery for manual work should be reflected in changed habits of food consumption. The growing mechanisation of industry is so important a part of the ordinary experience of our times that it is not necessary to insist further on the point. Closely connected with it is the change in the

occupational distribution of the gainfully employed population of almost all countries. An ever smaller fraction of the population is engaged in the primary industries of agriculture, forestry, etc., and a constantly increasing proportion in manufacturing, trade, transportation, clerical and professional occupations.

In the United States of America, for example, the percentage of gainfully occupied persons of 16 years and over engaged in agriculture and allied occupations fell from 41.2 in 1890 to 21.3 in 1930, while the percentage engaged in trade and transportation, clerical service, domestic and personal service, public and professional service rose from 30.7 to 48.1.¹ In the United Kingdom, the percentage of the occupied male population over 10 years of age engaged in agriculture is estimated ² to have fallen from 12 to 7% between 1891 and 1931, while the proportion engaged in transport, occupations other than general industry, and unoccupied rose from 34 to 51%. In France, the proportion of the productive population engaged in agriculture, forestry and fishing fell from 45% in 1906 to 37% in 1931, while the proportion engaged in trade, professional and public service rose from 18.7 to 22.3%.³ In Germany, 36.4% of the production population were engaged in agriculture in 1895 and 28.9% in 1933; trade and transport and public and administrative service accounted for 17.6% at the end of the century and 26.8% in 1933.³

Not only is agricultural work more arduous than the work connected with trade and transportation, clerical service and the professions (the relative importance of which increased notably), but to a large extent it is performed out of doors at all seasons and therefore requires greater food consumption to maintain constant body temperature as well as to provide more muscular energy. Furthermore, the introduction of mechanical methods has tended to replace physical labour in agriculture as well as in industry in Western countries, so that the average agricultural worker now probably expends less muscular energy than did the average agricultural worker of forty years ago.

¹ Figures compiled from "Recent Social Trends", Report of the President's Research Committee (New York and London, 1933).

² *Economist* (London), November 3rd, 1934.

³ Official census records.

69. In addition to the growing mechanisation of industry and the changed occupational distribution of Western countries, other influences have also had their effect on food requirements. The improvement in housing has reduced the amount of food required to keep the body at a constant temperature. The increased use of automobiles and the development of rapid transport within cities and towns had reduced the amount of walking. Less energy is spent in moving about, and less food is required to provide the energy for this purpose. On the other hand, the growing vogue of outdoor sports and physical exercise involves an increase in muscular effort and exposure to cold.

70. Changes in the character of work and life in modern civilisation have resulted, then, in changes in food requirements. It has been shown above that the general tendency of consumption has been to adapt itself to these changed requirements—less of the staple foods of high energy value are eaten, and more of the lighter fruits and vegetables and more dairy products. It remains now to indicate briefly how this change in food habits was possible. The foods which have tended to figure more largely in the diet are more expensive than those they have displaced and the modern diet of Western countries, better adapted though it is to the changed circumstances, undoubtedly costs more than the diet of forty years ago.

71. To answer this question in detail would be to write the economic history of the standard of living—a task which clearly cannot be undertaken here. It will suffice to state that the same factors which changed food requirements in Western countries simultaneously tended to provide the increased purchasing power necessary to buy the more expensive diet. The mechanisation of industry raised the productivity of labour; capital formation and technical progress made possible a higher output of goods of all kinds. The exchange of goods was facilitated by important developments in transport, national and international, and in credit systems. The growth of international trade—up to 1929—reduced the importance of national sources of supply.

72. This general growth in national income has been reflected in higher real wages of almost all classes of industrial workers. Moreover, in many parts of the world the State has played an

important rôle in improving the economic position of the lower-income sections of the community. Through unemployment insurance, minimum-wage laws, old-age pensions and other social services, the working-class income of many countries has been substantially increased and made more secure against cyclical fluctuations. Where this has occurred, it has, no doubt, been an important influence making for better nutrition. In a number of countries, indeed, the State has directly affected the nutrition of certain sections of the population by the direct provision of food, especially to school-children.

73. In addition to the general rise in national income and the tendencies making for redistribution of income in favour of the working-classes, another factor contributing to better nutrition in most Western countries has probably been the decline in the average size of the family. Food resources have, in many countries, tended to become more plentiful in relation to population. In a later chapter ¹ the intimate connection between the size of family and the standard of nutrition is shown in detail.

74. The important part which agriculture has played in the movement towards better nutrition is reserved for fuller discussion in the next chapter. At this point, however, attention may be drawn to one fact of special importance. Much of the improvement in nutrition which has taken place in the past has been due to a gradual or sudden decline in the prices of certain protective foods, which has removed them from the class of luxury products available only to the wealthy and put them within the monetary reach of the mass of consumers. This fall in prices has been due to improvements in the art of production, of processing and distribution, or the deliberate cultivation, through lower prices, of the market represented by the lower-income groups of the community.

A few examples may be quoted to illustrate the point. It has been shown above that, since the beginning of this century, and particularly during the past decade, a remarkable increase has occurred in the consumption of bananas and citrus fruit in most countries of Western Europe. In 1900, a banana was in the nature of a luxury:

¹ See Chapter 5, paragraphs 19 to 24.

a delicacy for adults and a reward for good behaviour in children. In 1900, a banana was retailed in London for twopence; in 1937, for a penny or less. In 1937, the retail price of foods as a whole was 50% higher than at the beginning of the century. Imports of bananas into the United Kingdom rose from an average of slightly more than $2\frac{1}{2}$ million bunches a year in the five years 1900-1904 and about $6\frac{3}{4}$ million bunches in the quinquennium immediately preceding the war to 15 million bunches in 1929 and over 20 million bunches in 1935.

More recently still, the same phenomenon can be observed for grapefruit. As recently as 1930, grapefruit were sold in Geneva at 1.20 to 1.50 francs by the few retailers who handled it. To-day grapefruit in no way inferior in quality are to be found in every grocer's shop at 20 centimes. The retail price of grapefruit in the United Kingdom averaged 6*d.* in 1920-1923, 5*d.* in 1924-1928, $4\frac{1}{2}$ *d.* in 1929 and 3*d.* in 1935. Imports into the United Kingdom were 1,200 tons in the first period, 13,100 tons in 1924-1928, 27,150 tons in 1929 and 59,500 tons in 1935.

75. Butter is another case in point. It has been shown above that in most Western countries there has been an upward tendency in butter consumption since the beginning of the century and that this tendency was much accelerated after 1929. The upward tendency during the first period must be ascribed partly to the introduction of factory methods of manufacture with the resulting economies of specialisation and large-scale production. The increase since 1929 is largely due to the sharp fall in butter prices, which has resulted in the substitution of butter for less nutritious but cheaper table-fats by the working population of many countries. Between 1929 and 1934, for example, the retail price of butter in the United Kingdom fell by 45% and *per caput* consumption increased by 45%. In France, the retail price fell by nearly 25% and *per caput* consumption increased by 25%.

76. In addition to the economic and technical factors responsible for the trend towards a more varied diet, the education of consumers has also played an important part. Since the development of the "new science of nutrition", public and private agencies in many parts of the world have disseminated among a constantly increasing section of the population a knowledge of the nutritive values of

different foods. This movement has gone farther in some countries than in others. It has, perhaps, reached its highest development in the United States, where various Governmental agencies, the medical profession, private associations and commercial interests have for many years been urging the public to eat more fruit, more vegetables and to drink more milk on account of their special nutritive properties.

If progress in education in other countries has been less sensational, it has nevertheless been substantial. During the past decade, the public health authorities of almost all European States have laid growing stress on the dissemination of nutritional knowledge among all classes of the population. The efforts of the public authorities in this direction have in many cases been ably assisted by private organisations. The amount of space which the newspapers of the United Kingdom, the British Dominions and the Continent of Europe now devote to the discussion of food problems and values and to the publication of balanced menus is a striking testimony to the growth of public interest in these questions.

77. Though much has already been accomplished towards the education of the consumer, a great deal remains to be done. Every fresh enquiry into the nutritional state of a population shows that, with the same money expenditure on food, some housewives are able to provide a diet of far greater nutritive value than others. In all sections of the community, education in the principles of nutrition—adopted to individual circumstances and taking due account of dietary habits and preferences—could do much to raise the level of nutrition.

78. The question of education is treated in detail later in this report.¹ Here it is sufficient to show, by means of a few examples, the degree to which ignorance either of the importance of nutrition to health or of the principles of correct nutrition continues to militate against rational food habits, even in countries where most progress has been made. An outstanding case is the use of white bread. During the past fifty years, the use of white bread of fine texture has become increasingly general among all sections of Western communities; in some countries, a social stigma has even come to be attached to the consumption of coarser bread. The

¹ See Chapter 6.

processes of milling were changed for this and other reasons (for example, the fact that white flour keeps better than less highly milled flour), in order to remove from the grain anything which would give the bread a dark colour or a coarse texture. This involved removing the bran and the germ from the grain—precisely those portions of the grain richest in mineral matters, as is shown in the following table:

Table XXVII.
MINERAL COMPOSITION BY WEIGHT OF WHEAT
AND WHEAT PRODUCTS.^a

	Ash constituents in percentage of edible portion.			
	Whole wheat	Wheat flour (white)	Wheat bran	Wheat germ
Potassium	0.473	0.115	1.217	0.296
Sodium	0.039	0.060	0.154	0.722
Calcium	0.045	0.020	0.120	0.071
Magnesium	0.133	0.018	0.511	0.342
Phosphorus	0.423	0.092	1.215	1.050
Chlorine.	0.068	0.074	0.090	0.070
Sulphur	0.181	0.177	0.247	0.325
Iron	0.005	0.001	0.008	

^a From H. C. SHERMAN: "Chemistry of Food and Nutrition", Appendix B, Table 61 (4th ed., New York, 1933).

When bread is made with flour that has been excessively milled, much of the valuable mineral elements of the grain fails to find its way into the bread.¹

For those able to afford a liberal diet, an abundance of green vegetables, fresh fruit and milk are more important and richer sources of mineral matter than wheat bran and wheat germ. But where dietaries are found to be deficient, minerals are, as a rule, among the main nutritive elements which fall below standard; the insistence on white bread keeps total mineral intake from being as high as it might be at the same level of food cost. It is of interest to observe that, in the United States, there is now, as a result of education, a reverse tendency away from white bread and towards whole-wheat bread. Moreover, the manufacturers of breakfast cereals have in recent years been tending to add the embryo of the grain to their products on account of its high nutritive value.

¹ Some authorities, including Sir Edward MELLANBY, member of the Mixed Committee, hold that the presence of certain mineral salts in large quantities in cereals prevents the absorption by the body of other mineral salts; it would therefore be necessary to recognise that the figures given in the above table of the amount of mineral matter present do not necessarily reflect accurately the amount which can be absorbed by the body.

79. Meat provides another important illustration of the scope for education. Since the war, there has been an increasing tendency for housewives in Western countries to concentrate on the "superior" cuts of meat, suitable for grilling or rapid roasting, and to neglect the allegedly "inferior" cuts suitable for stewing or boiling. It would appear that the nutritive value of these latter cuts is in many cases not inferior to that of the "prime" cuts. This development is partly due to an increased taste for steaks and chops, and partly to the fact that their preparation requires a minimum of time. The entry of women into industry and the development of interests outside the kitchen has put a premium on foods which can be quickly prepared. The concentration of demand on the "superior" cuts has inevitably resulted in a rise in their price relatively to other cuts; the quantity of the prime cuts on a beast does not change with fashion. The figures given below show the retail prices of various cuts of meat in three different countries before and after the war.

Table XXVIII.
RETAIL PRICES OF VARIOUS CUTS OF MEAT.

United States of America.				
	July 1914	August 1934	August 1936	Percentage change July 1914- Aug. 1936
	(Cents per lb.) <i>a</i>			
Sirloin steak. . .	59.5	72.5	84.2	+ 41.5
Plate roast . . .	28.0	22.9	31.7	+ 13.2
Great Britain.				
	July 1914	July 1936	Percentage change July 1914-1936	
	(Pence per lb.) <i>a</i>			
Ribs of beef . .	British	10	13½	+ 35.0
Thin flank . . .		6½	7	+ 7.7
Leg of mutton .		10½	15	+ 42.9
Breast of mutton		6½	7¼	+ 11.5
France.				
	July 1914	July 1935	Percentage change July 1914-1935	
	(Francs per kg.)			
Beefsteak	3.80	20.65	+ 443	
Flanks	1.70	7.10	+ 318	
Filet of veal.	3.60	21.10	+ 486	
Breast	2.20	9.40	+ 327	

a 1 lb. = 0.4536 kg.

The table shows that prices of "prime cuts" have risen much more than those of other cuts. It is clear that consumers' preferences have changed; and that with the same money expenditure on meat it is possible to get more food value than is now obtained through concentrating on the "prime" cuts.

80. As a final example of the harmful effects of prejudice and ignorance on food habits, the case of skimmed milk is worth mentioning. Before the war, considerable quantities of skimmed milk were consumed by the industrial working population of European cities. Since the war, more full milk has been consumed, and this is, of course, desirable. But a prejudice appears to have developed against skimmed milk in many countries, which has resulted in a decline in its consumption even by those not able to afford the more expensive full milk. In Sweden, for example, budgetary studies of industrial city and town workers show that the average consumption of whole milk rose from 194 to 223 litres per consumption unit between 1914 and 1933—an increase of 29 litres—while average consumption of skimmed milk fell from 68 to 8 litres—a decline of 60 litres. The same is true of other countries.

It is highly desirable that the consumption of whole milk should increase and every effort should, of course, be made to accomplish that end. But it is unfortunate that the prejudice against skimmed milk has, in certain cases, resulted in a reduction of *total* milk consumption. The special nutritive value of milk lies in its mineral and protein content, and this is in no way reduced through the removal of the butter-fat. On the contrary, pint for pint, skimmed milk contains more calcium, more phosphorus, more sulphur, more iron and more protein (though, of course, fewer calories) than full milk. Skimmed milk is much cheaper than whole milk, as the presence of the butter-fat raises the price, and could fall well within the reach of many who do not now buy full milk in adequate quantities. Even greater advantage is, perhaps, to be obtained from increased consumption of dried skimmed milk, either in cooking or as an addition to liquid whole milk. From the point of view of the consumer, there is no waste attached to dried milk: it is not perishable and its price is not raised through high distribution costs. A widespread understanding of the properties and uses of dried and skimmed milk would be of great advantage to the nutrition of the community.

81. In concluding this summary of the factors responsible for current trends in dietary habits, reference should perhaps be made to the decline in the consumption of alcoholic spirits. The following table shows, in litres of pure alcohol, the officially estimated *per caput* consumption of distilled spirits in various countries in selected years since the beginning of the present century:¹

Table XXIX.

PER CAPUT CONSUMPTION OF DISTILLED SPIRITS.

	1900	1905	1910	1913	1918	1920	1925	1930	1933
Denmark	7.02	6.34	5.65	4.81	1.12	1.54	2.07	2.14	2.19
France	4.58	3.52	3.54	3.92	...	2.01	2.70	2.80	2.61
Germany	4.40	3.70	2.80	2.80	0.60	0.70	0.99	0.75	0.77
Italy	0.62	0.77	0.70	0.67	0.48	1.01	0.63	0.44	0.28
Belgium	4.72	2.83	2.58	2.78	...	1.25	1.44	1.59	1.37
Netherlands	4.11	3.69	2.63	2.60	1.60	2.58	1.10	1.31	1.21
Norway	1.58	1.25	1.61	1.82	...	...	0.25	1.15	0.96
United Kingdom . .	2.88	2.44	1.50	1.74	0.80	1.22	0.83	0.65	0.56
United States . . .	2.46	2.68	2.70	2.84	1.66	0.42	<i>a</i>	<i>a</i>	<i>a</i>
Sweden	4.35	3.55	3.30	3.45	0.60	3.00	2.20	2.40	2.45

a Figures not available.

In almost all cases, the post-war figures are much lower than the pre-war. There seems little reason to doubt that the decline in the consumption of spirits has played a part of appreciable importance in the movement towards better nutrition. Its effects on nutrition have been both indirect and direct: indirect, through making purchasing power available for consumption of more nutritious items of diet (though it must be pointed out that the increased taxation of spirits in post-war years has made this influence less important than appears from an examination of the above table) and through helping to raise standards of labour efficiency; and direct, because the light refreshments, such as fruit, fruit-juice, ice-cream, used in place of distilled liquor, frequently have special claims to nutritional virtue.

¹ *Annuaire statistique de la France*, 1935.

Chapter 2.

AGRICULTURE AND NUTRITION.

A. INTRODUCTORY.

1. In the previous chapter, it has been shown that during the past generation certain well-defined changes have taken place in the food-consumption habits of Western countries. The average diet has become increasingly diversified and, in consequence better balanced. Consumption of fruit, vegetables and dairy products has almost everywhere shown a marked upward tendency, while the consumption of cereals has tended to decline and, in countries where consumption was fairly high, the average *per caput* consumption of meat has also fallen.

2. The question now arises: How has agriculture adapted itself to these changes in demand? It is hardly necessary to insist on the importance of this question. The success of the present nutrition initiative would involve an appreciable change in the food-consumption habits of all countries. This change will, of course, not take place in a day; it will occur gradually and (it is to be hoped) continuously, as the newer knowledge of nutrition is disseminated over wider groups of the population, as the general level of income rises, and as special action is taken by the State or private associations to improve the nutrition of particular groups of the population. But, even though the change in food habits may be gradual, it may none the less be profound; and it is therefore necessary to consider the capacity of agriculture to adapt itself to the changes in demand which would result from the general adoption of food habits more closely in line with the teachings of the modern science of nutrition. No one would desire that this nutrition endeavour should introduce new elements of instability and maladjustment into a world which can already count too many; least of all would it be desired to introduce factors of instability into the agricultural world, which

is only now beginning to recover from long and difficult years of depression.

3. Fortunately for the purpose of this analysis, the changes which have already taken place in food habits (and which have been traced in detail in the previous chapter) are, for the most part, changes in the right direction. The movement towards better nutrition does not, therefore, involve the initiation of new and revolutionary processes, but rather the acceleration and facilitation of processes already in being. Valuable light will therefore be thrown on the capacity of agriculture to adapt itself to such changes in food habits as are needed in the future by examining the part which agriculture has played in the changes which have taken place in the past.

4. In the section which follows, an attempt is made to state, in general terms, the nature of the problem of agricultural adaptation, and in Section C an analysis is made of some of the obstacles to adaptation. The rôle of agriculture in improving nutrition is, however, positive as well as merely adaptive; accordingly, Section D is devoted to a summary of recent changes in agricultural methods—in order to bring out some of the major influences tending to increase and improve the supply of foods. Finally, in Section E an attempt is made to assess, in general terms, the effects on agriculture of the present movement towards better nutrition.

B. THE PROBLEM OF AGRICULTURAL ADAPTATION.

5. The increased production and the changes in its structure which constitute the counterpart of the shifts in food consumption traced in the preceding chapter originate in part on the side of supply and in part on the side of demand. In some cases, the initiative has come from the producers, who developed the output of certain foods, improved their quality and proceeded to create a market through advertising, price reductions, etc. In other cases, the initiative has come from the side of consumers: as a result of changes in taste or requirements, certain foods were increasingly demanded, their production became relatively profitable and agriculture adapted itself to this circumstance.

6. If accurate historical statistics of supplies and of prices were available, an attempt could be made to measure the relative influence of the demand and the supply factors in particular cases; but, as these are not generally available, it must be sufficient here to indicate the nature and complexity of the problem. One of the most striking examples of changes in consumption originating apparently on the side of increased and improved supplies is that of citrus fruits. Production of these fruits was greatly intensified and extended in the late nineteenth and early twentieth centuries, the producers carried out an active campaign to educate the public to the nutritive value of orange juice, etc.; demand was stimulated, and this led to a further development of production. In the preceding chapter, reference has also been made to the effect of increased supplies on prices and consumption of bananas. At the beginning of the present century, only Canary bananas were imported into the United Kingdom; they retailed at about 2*d.*, the supply was limited and they were sold only in the more expensive fruit-shops and not consumed at all by the masses. About 1901, with the development of production in the West Indies, large quantities of bananas were imported from that source. Demand, however, was lacking, as the populace had little experience of bananas and had not acquired a taste for them. In consequence, they were sold for a time at the unrenumerative price of 2 for 1½*d.*, with the result that a general market was developed, taste for the fruit grew and demand rapidly increased. In Section D of this chapter, many examples are given of improvements in agricultural methods, which reduced the cost of producing food, improved their quality and brought about increased consumption.

7. Such examples make it clear that the changes in consumption habits traced in the preceding paragraph had their origin, in part, in changes in agricultural enterprise and methods. It would, therefore, not be legitimate to argue that the changes in production which formed the counterpart of the changing structure of food consumption represents exclusively the successful adaptation of agriculture to changed conditions of demand; and that policies designed to change food habits need not therefore concern themselves with the capacity of agriculture to make the necessary adaptation of production. Nor would it be legitimate to lose sight of the fact that the profound changes in conditions of food supply

and demand which occurred during the past decades involved certain agricultural systems in serious dislocation. Indeed, the increased competition of non-European agriculture imposed an extraordinary burden of adjustment and adaptation. In view of the difficulties in the way of adaptation (difficulties which are analysed in the next section of this chapter), it must be regarded as surprising that agricultural systems were able to adjust themselves as well as they have done; and that they have been able to reorientate production along lines which permitted the notable improvement in nutritional levels recorded in the previous chapter to be accomplished. This adjustment, however, was not without its costs and difficulties. Individual producers who were faced with increased competition or with a shrinking market for certain products, and who were unable for one reason or another to turn to other crops for which demand was expanding, were placed in a position of great difficulty and hardship. When demand declined or prices fell to unremunerative levels, the investment of capital and of long and arduous hours of labour failed to yield a return commensurate with that obtained in other occupations. The reorientation of production along new lines involved the loss of existing capital fixtures, the introduction of a new routine of cultivation, a break with the old methods. Even where capital was available to facilitate the process of adaptation, the adaptation itself not infrequently created new disequilibria. One example will suffice as an illustration. To meet the increased competition of overseas grain during the last quarter of the nineteenth century, mechanical methods were widely adopted in grain production in certain parts of Europe. The displacement of the horse by the machine during the early twentieth century led to a reduction in the demand for oats and other fodder crops and involved the producers of these crops in difficulties; many peasants, unable to sell their fodder crops, returned to more primitive methods of cultivation. On the other hand, there seems little doubt that the relative abundance of fodder crops resulting in part from this displacement was one of the factors stimulating animal husbandry and poultry-farming and so contributed indirectly to the increased consumption of the products of these branches of agriculture.

8. The brief considerations of the preceding paragraph are, perhaps, sufficient to make it clear that those whose task is to

safeguard the interests of agriculturists may reasonably ask that the effort of agricultural adjustment and adaptation which the present movement towards better nutrition involves should be clearly defined; and that, at the same time as steps are taken to raise nutritional levels, steps should also be taken to facilitate the adaptation of agriculture to the changes in the structure of demand which may result.

9. In attempting to define the effort of adaptation required of agriculture, particular stress must be laid on two points. The first is that nutrition policy does not involve a rapid transformation in the existing structure of national agricultural systems. The changes in demand which occur will of necessity be slow and gradual; the reorientation of production will be a long-run and not a revolutionary process. The second point is that, as nutrition policy moves towards its objective of an adequate diet for all, there will be an increase in the demand for all classes of agricultural products. Some groups of foods will, no doubt, benefit more than others; and it is likely that the demand for the protective foods will rise more rapidly than the demand for those consumed chiefly for their high energy value.

But, notwithstanding the considerable improvements effected in recent decades, the problem is not merely one of the qualitative composition of diets. For those fortunately placed whose general level of consumption is high, considerations of quality and composition of diet are, of course, of primary importance; and for these, improved nutrition means principally an increase in the consumption of protective foods. It is an unfortunate fact, however, that under-nourishment in the absolute sense still exists. Not only is it endemic in parts of Asia and Africa, where the general level of national income is low; it is found in Europe and America, and even in countries with the highest levels of income.

Clearly, the first aim of nutrition policy must be to ensure that all sections of the population have enough calories. It would be folly to allow the legitimate stress which is placed on malnutrition to obscure the existence of an equally real and perhaps even more pressing problem of under-nutrition. If man cannot live by bread alone, neither can he live by butter without bread. Energy requirements must first be met if full benefit is to be derived from the protective foods. Exact data on existing deficiencies in energy

requirements are not available, but there is no doubt that a considerable increase in the consumption of foods of high energy value—such as cereals, vegetable oils and, in certain countries, sugar—would be required in order to bring the calorie content of the diet of certain sections of the population of a very large number of countries up to standards of adequacy. For a long time to come, it appears likely that, taking the world as a whole, the increase in the demand for the energy-bearing foods among these population groups will—if nutrition policy achieves its objective—much more than counterbalance the fall in demand for them which accompanies the qualitative improvement in the diet of those who are already securing an adequate quota of calories.

10. Still other factors will tend to increase the demand for cereals in the future. One is the growth of population, which is still continuing in many countries. Not only does this growth involve an absolute increase in the energy requirements of the world as a whole, but it also tends to offset the relative reduction in the demand for the energy-bearing foods which will accompany an improvement in nutritional levels in countries where the level is already quite high. Moreover, sight should not be lost of the fact that increased consumption of the protective foods of animal origin will involve an increased use of cereals as animal feeding-stuffs.

11. It is clear, therefore, that nutrition policy by no means requires a drastic shift from the production of energy-bearing foods to the production of protective foods. Nor does it require that agriculture should produce protective foods in advance of the market—*i.e.*, before a demand at remunerative prices exists. What is required is rather that, as the movement towards better nutrition grows and spreads and as the demand for the protective foods in countries where the general plane of living is already high increases, national agricultural systems should gradually adapt themselves to the changing structure of demand and concentrate an increasing proportion of their productive resources on the protective foods. The best proof that agriculture is able to adapt itself to the expansion in demand for the protective foods lies in the fact that it is already doing so. The new tendencies in agricultural production in many countries are a clear illustration of this fact; in the paragraphs which follow, statistics are quoted to show the

extent to which certain national agricultural systems have been tending to increase their output of foods of high protective value.

12. A striking example is the increased attention which has been paid to dairy-farming in recent decades. In this field, Denmark provides the classic illustration of the adaptation of agriculture to a new situation. Formerly a cereal-exporting country, Denmark deliberately shifted the basis of her system to dairying and animal husbandry when the overseas competition in cereals rendered their production for export unprofitable in the eighties of the last century. The success with which this transformation was accomplished is so well known that it is unnecessary to quote details. It was facilitated by the high standard of education and spirit of co-operation among farmers, and its success was partly due to favourable natural conditions and to the close proximity of Hamburg and London, the main consuming markets. One aspect of the transformation is, however, worth stressing: far from this change in the structure of the Danish agricultural system resulting in a reduction in cereal cultivation, its effect was, on the contrary, to create a new demand for cereals (for animal feed) and so increase output. This is illustrated in Table I below:

Table I.

EVOLUTION OF DANISH AGRICULTURE.^a

A. Dairying.

	1870	1900	1934
Number of dairy cows	808,000	1,075,000	1,716,000
Average milk yield per cow (kg.)	1,350	2,200	3,200
Total milk production (million kg.)	1,100	2,500	5,400
Butter exports (million kg.)	10	61	150

B. Arable Farming; Harvest.

(Yearly average in millions of crop units).

	1880-1884	1910-1914	1929-1933
Corn	23.6	29.1	41.8
Roots and potatoes	1.8	18.6	30.5
Grass	15.1	21.9	34.2
Total	40.5	69.6	106.5

^a Data taken from the Agricultural Council, Denmark — Agriculture (Copenhagen, 1935).

In 1933, 50% of the cultivated area of Denmark was under grain. The percentage is among the highest in Europe and compares with 45% in 1881. These figures make it clear that the encouragement of animal husbandry is by no means inconsistent with the desire to maintain a large proportion of land under cereals in order to be able to feed the domestic population in the event of a national emergency. Further reference is made to this important point in the following section.

13. If the example of Denmark is classic, it is by no means unique. Table II below shows that there has been a universal advance in milk production during the past decade.

Table II.

ESTIMATED MILK PRODUCTION PER ANNUM.^a

	Average production per annum of milk. (In millions of litres.)		
	1925-1929	1930-1934	1934 or 1933
Austria	2,010 ^b	2,480 ^c	2,540
Belgium	2,760	2,970	3,050
Denmark	4,300	5,200	5,000
Finland	2,210	2,310	2,450
France	13,370	14,320	15,230
Germany	19,240	23,160	23,300
Netherlands	3,800 ^d	4,410	4,690
Norway	1,230	1,320	1,360
Poland	8,500	9,050	9,020
Sweden	4,020	4,510	4,510
Switzerland	2,710	2,740	2,800
United Kingdom	6,140	6,700	7,140
Canada	6,410	6,980	7,200
United States	42,970	46,120	46,030
Australia	3,640	4,570	5,210
New Zealand	2,900	3,920	4,280

^a League of Nations: "The Problem of Nutrition", Vol. IV — "Statistics of Food Production, Consumption and Prices", documentation prepared by the International Institute of Agriculture (Geneva, 1936).

^b 1923 and 1927. ^c 1930 and 1934. ^d Rough estimate based on 1921-1930 daily herd.

14. The tendency for agricultural systems to pay increasing attention to dairy-farming is further reflected in the increase in the proportion of dairy cows in herds, which is shown in Table III below.

Table III.

PROPORTION OF DAIRY COWS IN HERDS.^a

	1913 %	1923 %	1933 %
Australia	18.0	17.3	24.3 ^b
Canada	41.2	39.6	42.3
Denmark	53.2 ^c	51.3 ^d	56.5
France	52.7	53.1	54.2
Germany ^e	53.9	56.2 ^d	56.8
United Kingdom . . .	38.7	44.1 ^d	42.2
United States	36.7 ^f	34.5 ^d	38.6

^a Based on data published in Imperial Economic Committee: "Cattle and Beef Survey" (London, 1934).

^b 1932. ^e Percentage of all cows to total cattle.

^c 1914. ^f 1909-1913.

^d 1924.

15. Another striking example of the newer tendencies in agricultural production to which attention may well be drawn is the growth of poultry-breeding. Table IV below shows the changes in the number of hens in certain European countries since 1913:

Table IV.

NUMBER OF HENS.^a

	(In millions.)			
	1913	1926	1930	1934
Austria	—	5.7	5.9	8.7
Belgium	12.1 ^b	—	18.2 ^c	—
Denmark	15.0 ^d	18.5	22.1 ^e	26.6 ^e
Germany	64.0 ^f	67.8	88.1	85.9
Great Britain and Northern Ireland	38.3	48.3	61.9	78.5
Irish Free State	14.2	16.5	18.2	16.0
Netherlands	9.8 ^b	15.0 ^g	24.6	34.5
Yugoslavia	—	13.7	16.3	17.9

^a Data furnished by International Institute of Agriculture.

^b 1910. ^c 1929. ^d 1914. ^e 1933. ^f 1912. ^g 1924.

16. The increase in the output of eggs was even greater than these figures suggest, as there has been a steady increase in the number of eggs per laying hen.

Table V.

PRODUCTION OF EGGS.^a

	(In millions.)		
	1913	1926	1934
Belgium	960	2,354	2,070
Denmark	796 ^b	1,140	1,478 ^d
Germany	4,100	4,600 ^c	6,200
England and Wales	944	1,527	3,108
Scotland	177	215	414
Northern Ireland	—	412	536
Irish Free State	816	1,159	1,136
Switzerland	203	295	440 ^d
Yugoslavia	—	1,600	2,250

^a Data furnished by International Institute of Agriculture.

^b 1914. ^c 1927. ^d 1933.

17. In some ways, the most striking of the newer tendencies in agriculture is the recent development of horticultural production in all parts of the world. In all countries, the past decades have witnessed a remarkable expansion in the commercial production of fruit and vegetables. Thus, in Germany, the area under market gardens rose from 116,000 hectares in 1913 to 137,000 hectares in 1927 and 158,000 hectares in 1934. In England and Wales, the area devoted to vegetables rose from 74,540 hectares in 1925 to 92,550 in 1930/31¹—an increase of about 25%. In France, market-garden crops covered 325,000 hectares in 1927 and 371,000 hectares in 1934. In the Netherlands, the total area of family allotments and of market gardens producing for sale increased from 49,740 hectares in 1913 to 62,185 hectares in 1926 and 67,620 hectares in 1934. In the United States, the area under vegetable crops for sale doubled from 1919 to 1929, rising from 576,390 to 1,137,800 hectares.²

18. The extension of the area of cultivation of citrus fruits and the improvements effected in their quality have been mentioned above. Until about 1880, consumption was low and production was limited to Portugal, the Portuguese islands and the Mediterranean littoral. About the year mentioned, the United States and West

¹ *I.e.*, from about 185,000 to about 230,000 acres.

² *I.e.*, from about 1,450,000 to about 2,850,000 acres.

Indies became large producers, chiefly for American consumption; Mediterranean production continued to expand. During the past thirty years, production has been extended to the southern hemisphere; Brazil, the Argentine and South Africa have greatly extended the area under citrus fruit and have supplied the European market with the "summer orange", thus helping to reduce the seasonal fluctuation in the consumption of this important fruit. Production for domestic requirements has also been extended in South-Eastern China, Southern Japan and Australia. It is worth stressing the fact that the widening of the area under cultivation has not been at the expense of the traditional producers. On the contrary, exports of oranges from Spain rose from 817,000 dozen in 1886 to 2,600,000 in 1900 and 11,000,000 dozen in 1930; Italian exports of both oranges and lemons were twice as high in 1930 as in 1900. More recently, Palestine has greatly increased its importance as a producer; the area under oranges and lemons increased from an average of 5,340 hectares in 1925/26-1930/31 to 17,500 hectares in 1933/34, and exports of all citrus fruits rose from 2.7 million boxes in 1929/30 to 7.3 million boxes in 1934/35.

The adaptability of production is illustrated, not only in this expansion, but also in the change which occurred in the South of France in the latter part of the nineteenth century from the cultivation of oranges for fruit (which could no longer compete successfully with the increased imports from Spain) to the specialised cultivation of orange-blossoms and other blossoms for manufacture into perfume. During the past ten years, the increased consumption of fruit in France and the increased competition of synthetic perfumes have resulted in a marked tendency towards the growing of peach and apricot trees in this region.

19. In most countries of the temperate zone, the area under orchard and the production of fruit have been greatly increased in recent years. Moreover, important improvements have been effected in methods of production and marketing, and the quantity of commercially marketable fruit has risen more rapidly than the frequently imperfect data available for area under cultivation or total production suggest. The increase in the production of marketable fruit has made great headway in the United States, the Argentine and the British Dominions, but also in the United Kingdom and on the continent of Europe farm orchards are being

steadily displaced by commercial orchards planted with improved varieties.¹ The statistics available do not permit of an accurate summary of the extent of the recent changes, but the trend towards increased fruit production is very general. Thus, in England and Wales, the area under fruit was 275,000 acres in 1925 and 322,000 acres in 1935.² Not only has production been extended in Kent, the traditional garden of England, but new land has been brought under orchard in East Anglia and other parts of the southern half of England. In France, the production of fruit (excluding table grapes and production in private gardens) is estimated to have increased from less than 300,000 tons before 1927 to over 600,000 tons after 1933. In the Netherlands, the area under commercial fruit rose from 71,000 acres in 1925 to 87,000 in 1934,³ and the area under market gardens increased from 62,000 to 75,000 acres.⁴ In Norway, the number of fruit-trees is officially estimated to have increased by more than 10% between 1924 and 1934. In Roumania, the increase in recent years has been even more striking.

20. In certain countries of Central and South-Eastern Europe, the State has intervened to help and accelerate the process; and it is worth examining briefly the measures taken in one or two of these countries. In Bulgaria, for example, the difficulties encountered in selling cereals abroad led first to an increase of the production of tobacco for export; but, when tobacco prices fell during the recent depression, the peasants turned more and more to the production of other high-value products, principally vegetables and fruit. The initiative in this change in the structure of production lay with the producers and exporters, but since 1933 it has been encouraged by the authorities. Regulations have been issued for the control of the quality, state of preservation, freshness, packing, etc., of fruit and vegetables destined for export; and the success of these measures is witnessed in the figures for exports. Between 1929 and 1935, the quantity of fresh grapes exported rose from 2,100 tons to 34,000 tons; dried plums increased from 336 tons in 1927 to 9,900 tons in 1935; tomato exports rose from 195 tons in 1931 to

¹ See Imperial Economic Committee: "Fruit" (London, 1936).

² *I.e.*, from about 110,000 to about 130,000 hectares.

³ *I.e.*, from about 28,000 to about 35,000 hectares.

⁴ *I.e.*, from about 25,000 to about 30,000 hectares.

2,500 tons in 1935, apple exports increased from 219 tons in 1930 to 4,900 tons in 1935. The fact that this development took place in so short and unfavourable a period is a striking testimony to the capacity of agriculture to adapt itself to changed conditions of demand.

Hungary affords another interesting illustration of State assistance in fruit production. In 1929, a National Committee of Pomology was created at the Ministry of Agriculture to decide what types of fruit could be economically produced in the various parts of the country. The State established three public nurseries which distributed young trees, and regional orchards were established under State supervision in all parts of the country, where courses in fruit-tending were given to farmers and labourers. The Ministry of Agriculture, moreover, granted from 1933 to 1936 subventions and loans for the establishment of orchards to land-owners of 20 to 50 jochs; and fruit-packing courses were also held. An ordinance of 1934 grants tax exemption for a certain period to newly planted orchards. The number of fruit-trees in Hungary is estimated to have increased from 14.2 millions in 1929 to 15.3 millions in 1935; the increase was particularly notable for plum-trees, peach-trees and apple-trees.

21. The success of these various Government measures, designed to assist the adaptation of agriculture and improve agricultural methods, suggests that the reorientation of agricultural production towards an increase in the supply of protective foods might be further materially assisted by suitable State action. In particular, attention may be drawn to schemes adopted in some countries for recording the results obtained by farmers; the milk yield per cow, the efficient conversion of feeding-stuffs into pork or beef, egg yields, etc. The adoption of such schemes on a local or even parochial basis, especially where combined with competitions and substantial prizes, may stimulate the interest of individual farmers in the improvement of agricultural methods and help to accelerate and spread the application of improved methods, once they have been discovered.

C. OBSTACLES TO AGRICULTURAL ADAPTATION.

22. The problem of agricultural adaptation has been posted in the previous section. It has been argued that, if nutrition

policy moves forward on a broad front, there will result an increase in the demand for all classes of agricultural products—energy-bearing foods, protective foods and fodder crops alike. It has been suggested that, in countries where the general level of consumption is already relatively high, the success of the present nutrition endeavour is likely to entail a relatively greater increase in the demand for the protective foods than for the energy-bearing foods. The problem of agricultural adaptation in these countries may therefore be regarded as that of gradually reorientating production along the lines of a greater emphasis on the output of protective foods. On account of their perishable nature, many of these foods cannot enter into international trade, and a large increase in consumption is dependent upon domestic production. Statistics have been quoted to show that the current tendency in agricultural production in many countries is to pay increasing attention to dairying, poultry-breeding and horticultural production, and thus to increase the supplies of these highly nutritive products.

23. It is necessary to recognise, however, that there are obstacles in the way of the desired reorientation of agricultural production. The present section is therefore devoted to the enumeration of some of these obstacles and to a description of the efforts which have been made in the past to overcome them. Those obstacles to adaptation which have their origin rather in State policy than in natural conditions, however, are reserved for consideration in Chapter 4.

24. Perhaps the most serious lie in natural factors—soil and climate—and in technical organisation, which in some cases tends to limit the degree to which changes in production can be brought about. The importance of these factors in determining the character of the foods at present being produced differs greatly in the various parts of the world. Natural and technical factors are probably less important in Western Europe than in certain overseas countries. In the latter, vast areas of land are available; wheat is produced at relatively low cost through extensive methods, and cattle can (in the southern hemisphere) graze on open land throughout the greater part of the year, thus minimising the cost of handling, housing and feeding stock. The types of cultivation in these countries producing for export can be presumed to reflect

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broadly the comparative efficiency and cheapness with which the different crops can be produced in the given natural conditions. These natural conditions limit the alternative opportunities. To take but one example, the possibility of turning from wheat to other crops in Western Canada is limited by the climate. The long cold winter, lasting for about seven months, necessitates the housing of live-stock; green pasture lasts for only a few months and may be destroyed by drought. But, even in Western Canada, there has been a tendency to produce more live-stock and more poultry and vegetables in recent years—a tendency which has been reinforced by the partial closing of foreign markets for wheat.

25. In most of Western Europe, natural conditions frequently play a less important part in determining the character of production, which is, indeed, sometimes ill adapted to the nature of the soil, the climate and the technical conditions of cultivation, such as the size of the farm. Here the obstacles to the adaptation of agriculture to the new consumption trends have been partly the special mentality of the peasant, partly the form of existing capital investment and partly the protection afforded to certain types of produce. Agriculture throughout a large part of Europe is less a form of economic enterprise than a way of life: in this respect, it differs radically from some overseas countries. Attachment to the soil and a tradition of cultivation is handed down from one generation to another; the peasant is frequently conservative in his outlook. Once the production of an individual farm is planned, it is difficult to change, and change may involve new capital expenditure and the partial loss of existing capital fixtures. Furthermore, individual producers may at times be unaware of general market trends and have no inducement to concentrate on one crop rather than on another. In this field, Governments have an important task to perform in informing producers of the trends in consumption and in facilitating the necessary changes in production.

26. Special importance must, moreover, be attached to the part which the Agricultural Co-operative Organisation can play (and has already played) in this connection. It would, indeed, be difficult to exaggerate the contribution of these organisations towards the adaptation and improvement of agriculture and consequently to improved nutrition. The shift in the basis of Danish

agriculture referred to in the preceding section would scarcely have been possible had it not been for the high spirit of co-operation among the farmers of that country. "Beginning with the care and feeding of stock, the upkeep of cattle-sheds, etc., the producers assume very strong obligations by adhering to the rules and regulations of the co-operative dairy to which they belong. But this is not enough. The incessant improvement of the best methods must rest on increasingly exact observations which call for special knowledge and sometimes costly apparatus. Further, such observations must be recorded and examined. All this constitutes a task for which producers were not long in recognising that they had neither time nor always the necessary qualifications. They therefore delegated it to 'inspection societies', the first of which was founded in 1895. To-day there are several hundred such societies, all created and financed on co-operative principles by the producers themselves. It is thanks to these societies that it has been possible gradually to eliminate diseased cattle, to select the breeds and animals with the highest yield, to improve feeding-stuffs, etc. In a general way, their activities, often closely combined with those of the stock-breeding co-operative societies, have been and still are decisive for all technical progress of dairy production."¹

Through scientific research and experiment, through improvement of animal and vegetable species, through improvements in methods of production, through training and education, through the encouragement of emulation and through disciplinary action and supervision, the agricultural co-operatives of many countries are doing much to orientate production along certain lines and to improve and guarantee the quality of the products placed on the market.²

27. The evidence goes to show, however, that farmers in general have adapted themselves not unreadyly to changes in demand with considerable rapidity when these changes have expressed themselves in a modification of the relative prices of different types of agricultural products. When such price changes are checked by compensatory Governmental measures, the inducement to the farmer to alter his production is removed and nutritional

¹ See International Labour Office: "Workers' Nutrition and Social Policy" (Geneva, 1936), page 163.

² See International Labour Office: "The Co-operative Movement and Better Nutrition" (Geneva, 1937).

levels may suffer in consequence. This aspect of the problem of agricultural adaptation is dealt with in a later chapter, as it cannot be separated from the problem of relative prices. Certain other factors affecting the response of agriculture to changes in demand may, however, conveniently be considered first.

28. In Eastern Europe, where the nutrition problem is most important for the peasant population, a major obstacle in the way of improvement is the low level of output and, in certain countries, the high density of the agricultural population. The agrarian reforms which took place after the war divided up big estates into smaller units which were generally better adapted to intensive animal husbandry than to cereal cultivation. To some extent, there has been a favourable change in the character of production; but the lack of financial resources has prevented the movement towards animal husbandry from going very far. Where cereals continue to form the principal crop on the small estates, yield per man engaged in agriculture and yield per acre remain low, as the methods in use are frequently primitive. The suggestion is frequently made that the growth of industrialisation will raise nutritional levels in these Eastern-European States by reducing the number of people who draw their sustenance from the soil. The gradual improvement of methods of cultivation and the tendencies already in progress towards diversification of production will also serve this end.

29. Lack of capital resources must be counted among the most important hindrances to increased diversification of agriculture and increased agricultural efficiency. This is more especially true of the peasant States of Eastern Europe, where the rate of capital accumulation is low; but the statement applies as well to Western countries. A capital outlay is required to acquire live-stock, to house them and to buy fodder crops for them where cereals are not grown and green pasture is not available. Fruit-trees do not bear for two to six years, and resources must be tied up for this period. Efficient methods in arable farming generally involve the use of some machinery or machine-made implements and capital outlay for other purposes. In many countries, credits are not readily available for these purposes, or available only at rates which lay a very heavy burden on the borrower. In 1930, the

Sub-Committee on Agricultural Credit of the Commission of Enquiry for European Union expressed the view that:

“Lack of capital was one of the major factors which prevented the agriculturist from changing from those crops of which there was at present an excess to those the consumption of which was tending to increase. Moreover, all measures aimed at raising the standard of living in those European countries where the standard is at present relatively low must help to increase the demand for the higher-value agricultural products, such as meat, milk, fruit, etc. The granting of credit, and more especially the granting of credit where rates of interest are now abnormally high, would therefore help, on the one hand, to bring about those changes in production and, on the other, that increase in demand which are alike necessary for a general improvement in agricultural conditions. They would also certainly have the effect of increasing the purchasing power of agriculturists, and particularly their demand for industrial products.”

30. Up to the present, this analysis has been concerned with the obstacles in the way of the adaptation of production to the new consumption trends. These have been shown to be natural conditions, the conservatism of producers, commercial policy and penury of capital. Brief reference must now be made to another group of factors, connected with the marketing and distribution of foods, which have prevented the production and consumption of the protective foods from increasing more rapidly than it has done.

31. The quality of certain of the protective foods at present put on the market in some countries leaves much to be desired. Milk is the most important example, because, though it is one of the best foods available, it can also be the most dangerous. Quite apart from the varying nutritional value and chemical composition of milk (which depends upon the breed of cows, methods of feeding and methods of maintenance), there are the separate problems of its cleanliness and its safety. The question of quality is important also for eggs, fruit and vegetables. The consumer of eggs wants a guarantee of freshness; many countries have imposed standards of quality based upon an examination of egg contents by candling. The quality of fresh fruit and vegetables is more immediately apparent to the consumer. In recent years, the consumer has become more meticulous in his demands; attractiveness of appearance and uniformity of size and quality have become increasingly important.

Certain countries have imposed grading schemes, but, in others, fruit and vegetables of very different degrees of quality and attractiveness are placed indiscriminately on the market; and the uncertainty which results in the mind of the purchaser necessarily discourages the development of regular habits of consumption. It is clearly in the interests of producer and consumer alike that standards of quality should be laid down and that prices should bear some relation to these standards. Not only does this give the consumer a greater guarantee that he is getting merchandise of the quality he chooses to pay for, but it also provides a greater incentive to producers to improve the quality of their output. In this field also, an important contribution has been made by agricultural co-operative societies. Desirable as improvements in quality are, however, the tendency among distributors in some countries to lay too much emphasis on appearance and elaborate packing is one to be deprecated; it often renders nutritionally valuable fruit and vegetables unnecessarily expensive, and sometimes leads to the less attractive but wholesome products being eliminated altogether instead of being sold at reduced prices.

32. The perishable nature of many of the protective foods is a formidable obstacle to the rational organisation of the market, and must therefore be regarded as an obstacle to the reorientation of agricultural production. Many protective foods must be disposed of as soon as they are ripe, and the market is not always in a position to absorb the quantities coming forward at prices remunerative to the producer.¹ Prices to the producer fluctuate widely, not only in different seasons, but also in much shorter intervals, even at times in the course of a day; and there are frequently large differences between the prices which a commodity will fetch in different markets of the same country.² This adds an element of speculation to the production of fruit and vegetables, which has probably prevented the tendency towards this form of cultivation from going farther than it has gone.

33. In recent years, however, great advances have been made in refrigeration, cooling and storage; and it is to be expected that, as

¹ See paragraph 30 in Part II, Chapter I, above, on fish marketing.

² United Kingdom Ministry of Agriculture and Fisheries: Economic Series No. 25 — "Vegetable Marketing in England and Wales" (London, 1935).

further progress is made along these lines and as the methods already known are brought into general use, the problem of the perishability will tend to become less important and its significance as an obstacle in the way of agricultural reorientation accordingly reduced.

It is only necessary to recall the part which refrigeration and chilling have played in regularising the supplies of meat to realise the possibilities. Until the invention of refrigeration by Carré in 1861, meat had either to be sold within a few days of slaughter, regardless of market conditions, or "cured". With the introduction of refrigeration, winter conditions were artificially created in packing-houses throughout the whole year and packing could be carried on without interruption. Refrigerated meat could be kept in the cool chamber for several weeks and marketed in good condition and orderly fashion. The subsequent application of the process to railway and ocean transport did away with distance as a factor in meat supplies.¹

Latterly, refrigeration has been successfully applied to horticultural produce in many countries. In the United States, for example, growers and distributors, in co-operation with railway and steamship companies, have developed facilities making possible the shipment of produce for great distances under controlled temperature and humidity conditions, and it is estimated that over two-thirds of all horticultural produce shipped by rail and by water are handled under these conditions. Extensive terminal cold-storage warehouses have been established at the larger and moderate-sized marketing centres; such warehouses have also been set up in the larger producing areas, where fruit and vegetables can be held under best conditions during the harvesting rush or stored pending the development of a favourable market.

The application of pre-cooling at the point of origin has reduced the amount of refrigeration required in transit. Preservation has also been achieved through freezing, and important research is now being carried out which seems destined, in time, to make freezing a standard technique in fruit and vegetable preservation. During the past few years, the freezing method of preserving peas has been used commercially in London.

¹ See United Kingdom, Ministry of Agriculture and Fisheries, Economic Series No. 6: "Report on the Trade in Refrigerated Beef, Mutton and Lamb" (London, 1925).

Refrigeration and cold storage have been used to an increasing extent in recent years in Western Europe. Striking progress has, for example, been made in Italy in the establishment of regional and local centres of pre-cooling; a large cold store was erected at Verona in 1931 and the State Railway system is well equipped to transport perishable goods in excellent preservation. In France, the necessary installations have to some extent been set up in Provence, the Rhone valley and Roussillon and railway refrigeration has been made available in these districts. In the Netherlands, two cold-storage houses with capacity of 500,000 kg. each have been established in the fruit-producing region of Betuwe; in Sweden, there are several large refrigeration plants near the principal fruit-growing districts, and in recent years many small pre-cooling stations have been set up by berry-growers. In Germany, a beginning has also been made: experiments carried out in 1931 showed that asparagus could be successfully stored for eight weeks, and the price realised at the end of the period was one-third higher than at the time of purchase. In Switzerland, interesting experiments have been carried out, *inter alia*, by the Station fédérale d'essais viticoles et arboricoles, at the cold-storage plant established at the Geneva railway terminus in 1932. In the Argentine, all fruit destined to be exported in refrigerated chambers has to be subjected to pre-cooling for anything up to twenty-four hours before loading. In general, the use of cold preservation of fruits and vegetables is at its beginning in Western Europe, the United States and South America, and is scarcely known in Central and Eastern Europe.

34. Substantial advances have also been made in canning methods in recent years and the industry shows a remarkable growth throughout the world. The canning and drying of fruit and vegetables, the manufacture of jam and fruit-juice, the brining and pickling of vegetables are all worthy of mention as technique tending—along with refrigeration and cold storage—to reduce the commercial hazard in producing perishable foods and to afford consumers a more uniform supply at more reasonable prices.

35. The importance of adequate and economical transport facilities for fruit and vegetables has been referred to above. In the opinion of many, the great expansion of fruit and early vegetable culture in France during the past half-century is largely due to

the railways. Schedules are fixed with the needs of producers and the market in view; thousands of specially ventilated express wagons have been constructed; end-of-season rates are given on certain vegetables consigned to the Paris market; at least one company has set up an agricultural research department to disseminate scientific knowledge and has distributed plants and seeds free of charge. In certain European States, on the other hand, no special facilities whatever exist for the transport of perishable goods; ordinary goods vans are used and quality and appearance are frequently seriously impaired by the time the commodities reach their destination.

36. The question of transportation charges is obviously important; in some countries, these appear to be very high in relation to the product's value and to limit the development of consumption.

37. Of still greater importance is the whole question of the organisation of distribution and marketing. A wide range of problems enters into consideration in this connection, and it is not possible at this point to do more than briefly indicate some of the more important. Reference has already been made to the desirability of improved methods of grading; in addition to the advantages already mentioned, the easy identification of produce on the basis of grades would be of great assistance to the wholesale and retail trader and would eliminate waste arising from the purchase of unsaleable goods which prejudice the consumer and for which, ultimately, he must pay. Methods of packing must also be mentioned in this connection. In many countries, a large proportion of fruit and vegetables is marketed loose. They are handled several times before they reach the consumer, and each handling increases the risk of deterioration both of quality and of appearance. When containers are used, they are frequently overloaded and sometimes include low-grade material which cannot be sold but adds to the cost of transport.

38. The organisation of the wholesale and retail trade varies widely in different countries and it is difficult to make any generalisations in this field. The complaint is frequently heard that the number of middlemen handling food products is excessive, that retailers' margins are high and that the wide spread which frequently exists between the price the producer gets and the price

the consumer must pay is a factor of major importance in restricting consumption.

39. In the present sections have been enumerated some of the more important obstacles to the adaptation of agriculture to the new consumption trends. Attention has particularly been directed to the importance of natural conditions, lack of capital, tradition, low level of agricultural technique and the perishability of certain of the protective foods; and an account has been given of some of the attempts being made to overcome certain of these obstacles and so assist agriculture in its task of adaptation. One particularly important obstacle—namely, Government policy—has been reserved for separate treatment in a later chapter.¹

D. RECENT CHANGES IN AGRICULTURAL METHODS.

40. The general conclusion to which the preceding sections points is clear. By and large, agriculture shows an inherent capacity to meet new requirements as they develop. Obstacles, both natural and artificial, do no doubt exist; but the analysis of their nature suggests that, given wise and sympathetic consideration, many of these obstacles can be overcome. There need, therefore, be no serious misgivings regarding the capacity of agriculture to adapt itself to the changes in consumption habits which will result from an acceleration of the movement towards better nutrition.

41. This statement, however, minimises the part which agriculture has played in the considerable improvement in nutritional standards which has already taken place; and it gives not even an approximate idea of the capacity of agriculture to contribute to the improvement in food-consumption habits which may be expected in the future. For the contribution of agriculture and agricultural science has been positive as well as merely adaptive. Through the application of new methods to the production of foods, yields have been increased, qualities have been improved, new varieties have been invented. If the economic problems with which the world is faced to-day are to some extent problems of abundance rather than of scarcity, it is thanks in part to the inventive genius

¹ See Chapter 4 below.

of those who have concerned themselves with agricultural methods and to the enterprising spirit of those who have applied them. The application of science to agriculture has produced a technical revolution parallel to, though less spectacular than, the industrial revolution.

42. Recent technical changes have been mainly of two kinds: the use of mechanical processes instead of hand labour, and the application of biology and chemistry to agriculture. Mechanical processes have, up to the present, been most conspicuously successful in connection with grain production. For tilling and ploughing, the mechanical tractor is in common use in the United States and Canada. The number of tractors in use in the United States rose from 246,000 to 920,000 between 1920 and 1930; at the same time, the number of horses fell from 17.2 to 12.9 millions. Until the invention of the reaper and binder, one man could cut grain by scythe at the rate of about an acre a day, or by horse-drawn reaper at the rate of less than 10 acres a day. The reaper and binder reduced the costs of cereal harvesting greatly; it came into general use in the United States in the 1880's. In the 1890's, the combine harvester began to be used in that country, and by the outbreak of the war its use was general. With the aid of this machine, two men can harvest 50 acres of wheat per day. The combine harvester is most adapted to countries where grain is grown on large holdings and where the standing crop is ripe and completely dry at harvest time. At present it is most commonly used in the United States, the Argentine, Australia and parts of Canada and the Union of Soviet Socialist Republics. In 1918, fourteen combine harvesters were at work in Kansas; by 1929, the number had risen to 25,000. The use of these mechanical methods is most common in the countries of extensive grain cultivation. The following table shows the total mechanical and animal power estimated to be available to agriculture in the United States, for example:

Table VI.
TOTAL AND MECHANICAL HORSE-POWER IN THE UNITED STATES.

Year	Total horse-power (000,000's)	Horse-power contributed by mechanical power (000,000's)
1910	27.9	6.8
1920	37.5	16.2
1930	70.5	53.3

But the trend towards mechanisation of agriculture is evident elsewhere; it is of course partly responsible for the general decline in agricultural populations referred to in the preceding chapter. Thus, in the United Kingdom, the number of horses used for agricultural purposes fell from 807,000 in 1913 to 386,000 in 1935; 6,400 tractors were sold in 1935, compared with 3,800 in 1931. Where labour is abundant and the farm unit small, manual processes continue to predominate. Thus, according to figures published by the Roumanian Ministry of Agriculture,¹ 36.6% of the peasant properties of that country are entirely without animal traction, to say nothing of mechanical traction. The countries where mechanisation has gone farthest are those in which agricultural labour is (or has in the past been) scarce in relation to land.

43. The use of mechanical processes has been most striking in tilling, ploughing and the harvesting of grain, but most branches of agriculture have been affected. Thus, haymaking devices, milking machines, beet-lifters, fruit and egg graders and planting machines are becoming more and more widely used.

44. The application of the biological and chemical sciences to agriculture has given even more far-reaching results than the application of mechanical processes. A classic example is the breeding of Marquis wheat in Canada just before the war. This grain ripens up to ten days earlier than those previously in use, and it has enabled the frontier of wheat cultivation to be pushed 100 miles north and is estimated to have added 100 million acres to the potential wheat-belt of Canada alone. Through further crossing and selection, still earlier maturing varieties, notably Garnet wheat, have been developed in recent years. In other countries, notably Australia, the United States and the Union of Soviet Socialist Republics, similar results have been obtained, particularly in the development of drought-resistant breeds of wheat. The effect of these developments has been enormously to increase the world's potential wheat reserves.

45. Another striking example of plant breeding is the crossing of a wild cane with a cultivated variety in Java; the resulting hybrid (the famous P.O.J. No. 2878) had a yield 15 to 20% higher

¹ Quoted in *Epica*, February 19th, 1937.

than any variety previously known. The use of this cane has, with careful husbandry, increased the yield of sugar on the island to as high as 6 tons per acre, as compared with an average of 16 cwt. per acre in 1840-1843. Striking progress has also been made in the technique of sugar-beet cultivation.

46. Examples of the work of the plant-breeder could be multiplied almost at will. Not only in rye, maize and rice, but also in fruit and vegetables, varieties have been produced which have greatly increased yields or improved quality with little or no additional cost. In the Union of Soviet Socialist Republics, for example, varieties of fruit have been developed which grow to maturity in cold northern climates. In the United States, experiments have been conducted in the breeding of citrus fruits with a view to selecting strains with the richest vitamin contents. Especially noteworthy from the point of view of the potential supply of the protective foods of animal origin is the selection and crossing of grasses, clovers, lucernes and other fodder crops. Elsewhere, pasture plants have been produced with two or three times the feeding value of natural pastures. Through the cultivation of varieties which grow early in the spring and late in the autumn, the grazing season has been extended. Moreover, in recent years, important progress has been made in drying young grass for winter feeding. The process of haymaking has been long known to be wasteful of feeding value, including vitamins and minerals; an official enquiry has estimated the loss in nutritive value involved in making grass into hay at £5 million annually for Great Britain. The same enquiry estimates that, in order to obtain the nutritive value of a ton of dried grass by buying other feeding-stuffs, it would be necessary to pay £7 10s., while the cost of producing a ton of fresh grass is estimated at about £2. It is obvious that there is a considerable margin to pay for the cost of drying, and in future the use of this process may become important. In Denmark, strains of mangolds have been bred with extremely high solid-matter content and nutritive value, and the bad strains, consisting largely of water, have been forced out of cultivation. A great advantage of scientific advances in connection with grass and other fodder crops is that they enable the output of the protective foods to be increased without recourse to new land.

47. One aspect of the work of the plant-breeder the importance of which can scarcely be exaggerated is that the principal cost which it involves is the original non-recurring one of research. Once the desired strain has been developed, the seeds are scarce and relatively costly only for a few crop seasons; when the new seed gains general acceptance and use, it costs no more than the older, less productive strains. No capital outlay is therefore involved in the utilisation of scientific discoveries in this field.

48. In the field of animal husbandry, breeding and feeding have greatly increased food output per animal. As a result of research and experimental work in animal nutrition, precise standards are now available for live-stock feeding. The application of up-to-date methods has given remarkable results wherever it has been attempted. Table I above shows, for example, that in Denmark the average annual milk yield per cow rose from 1,350 litres in 1870 to 2,200 litres in 1900 and 3,200 litres in 1934; at the same time, the butter-fat content also increased. In England and Wales, the average yield of cows recorded by the milk-recording societies increased from 599 gallons in 1918/19 to 700 gallons in 1932/33.¹ In New Zealand, the average production of butter-fat per cow, which had increased by about 25 lb. between 1901 and 1920, increased by 69 lb. between 1920 and 1934. In Estonia, average annual output per cow rose from 2,015 litres in 1923/24 to an average of 2,500 litres in 1933, and in Finland the increase was even greater. So far as meat production is concerned, the progress of the past century can be summarised in the statement that the carcass dressed weight of a two-year-old animal to-day is equivalent to that of a five-year-old beast a hundred years ago. Great progress has also been made in poultry-breeding; it is estimated that between 1913 and 1934 the average annual output per hen rose from 80 to 90 eggs in Germany, from 80 to 115 in Belgium, from 75 to 120 in England and Wales and from 100 to 124 in the Irish Free State.

49. Reference should perhaps also be made to the work of the chemist and bacteriologist in maintaining and increasing soil fertility, to the work of the entomologist in combating plant disease,

¹ *I.e.*, from about 2,725 to about 3,200 litres.

and to the work of the geneticist in improving breeds and of the veterinary surgeon in reducing animal disease. But the examples already given are sufficient to indicate the extent to which agriculture and agricultural science have contributed to the improvement in nutritional standards.

50. Steady progress is being made in the dissemination and application of scientific information. The International Institute of Agriculture is charged with an important task in arranging for the international exchange of scientific research. Governments and educational institutions in all countries are paying increasing attention to the necessity for acquainting the individual farmer with the results of scientific research. Useful work in this field is performed by national organisations such as the Imperial Agricultural Bureaux of the British Commonwealth, and by various technical journals engaged in the constant review of scientific literature affecting agriculture. The agricultural co-operative movement in certain countries is also making an important contribution along the same lines. But in many countries the machinery of education is inadequate, and important results could be achieved through the expenditure of relatively small sums of money in encouraging the adoption of proved methods and processes. Even if, during the next five years, no further new discoveries were made, but intensive national efforts were concentrated on securing the application of existing knowledge, the results on agricultural prosperity and nutritional standards would be enormous.

E. EFFECT OF IMPROVED NUTRITION ON AGRICULTURE.

51. World agriculture and national agricultural systems cannot fail to gain from the acceleration of the movement towards better nutrition. The improvement in the quantity and quality of diets which nutrition policy aims to accomplish involves an increase in the demand for all classes of agricultural products. There is everywhere among consumers a latent demand for additional food to ensure optimum health; and everywhere among producers the capacity to supply these additional needs exists. It is not possible to estimate accurately how the demand for each individual food will be affected. In some countries, where the level of national income is low, improvement in diet will take the form principally of

increased consumption of foods of high energy value. In others, where average income is high, the stress will be more particularly on the protective foods.

But, even in these countries, recent studies of consumption suggest that appreciable sections of the population are not at present consuming enough of the energy-bearing foods, and that there is a latent demand for them as well as for the protective foods. Moreover, in countries where the stress is placed on the qualitative composition of diets, this generally involves an increase in the consumption of foods of animal origin; this, in turn, implies an increased demand for cereals and other products of arable farming for use as feeding-stuffs. It is therefore clear that all branches of agriculture will benefit from the steps which are taken to bring national diets closer to the norms laid down by modern physiology.

52. The information at present available regarding national food-consumption habits is not sufficient to form the basis of an accurate judgment of the extent to which consumption falls short of standards of adequacy. Estimates have, however, recently been made which illustrate how profound would be the beneficial effects on agriculture if all sections of the population of two countries where the general level of consumption is already high were adequately fed. For the United Kingdom, it has been calculated ¹ that, if the food consumption of the whole population were raised to the level of the top 10%, this would involve an increase in the demand for milk of 80%; for butter, of 41%; for eggs, of 55%; for meat, of 29%; and increased expenditures on fruit and vegetables of 124 and 87% respectively. For the United States, it has been estimated ² by the Bureau of Agricultural Economics that the land (exclusive of grazing-lands) required to produce diets of specified nutritive contents ranges from 1.2 acres per head per year for a "restricted diet for emergency use" to 2.1 acres for a "liberal diet".³ The latter figure is 10% higher than the average acreage used to produce the type of food apparently consumed during 1927-1931. It is obvious that the figures quoted in this paragraph

¹ J. B. ORR: "Food, Health and Income" (London, 1936).

² See U.S. Dept. of Agriculture, Circular No. 296: "Diets at Four Levels of Nutritive Content and Cost", by Hazel K. STIEBELING and Medora M. WARD (Washington, 1933).

³ For the content of these diets, see Chapter 5, paragraph 14, below.

must be treated with reserve; none the less, they illustrate the extension of agricultural activity which would result from the success of nutrition policy.

53. As the movement towards better nutrition spreads and grows, certain adjustments will be called for in national agricultural systems. Diversification of diet involves diversification of agricultural production. As the highly protective foods (dairy products, fruit and vegetables) tend to constitute a larger proportion of the national diet, in countries where the general level of consumption is already relatively high, there will be a tendency to shift from the production of the staples to the production of these foods. Many of them, such as liquid milk and some fruits and vegetables, cannot, owing to their nature, enter largely into international trade; and all national agricultural systems are consequently likely to be directly affected by the changing structure of domestic demand.

The commodities with an upward trend of consumption are, characteristically, high-value goods. Per unit of land used or per unit of capital invested, they bring a higher return to the producer than the foods of high energy value. This is particularly the case wherever the greater part of the agricultural land is held in small holdings ill adapted to mechanised low-cost methods used in the production of cereals on the extensive holdings of the non-European countries. These small holdings are, on the other hand, very well adapted to animal husbandry and the more intensive cultivation of fruit and vegetables. Soil fertility is, moreover, increased through the farmland manure which forms an important by-product of animal husbandry.

54. The diversification of production which would result, and has already resulted, from national agricultural systems adapting themselves to the new consumption trends not only involves a concentration on higher-value crops: equally important is the fact that it involves the spreading of risks and consequently an increased guarantee of agricultural stability. A very striking feature of recent years has been the persistence with which the demand for fruit and vegetables in most countries increased, even in the years of deepest depression. The strength of the underlying trend of the new food habits could not be more

convincingly demonstrated. The price of no product is immune from the general downward sweep which occurs during a period of economic depression; but it is obvious that commodities for which the underlying trend of demand is upwards are in a less exposed position than others. During the recent economic depression, the prices which the producers of many countries received for liquid milk for human consumption, for fruit and for fresh vegetables fell both later and less than the prices of the staple foodstuffs. To quote only one example, the following table shows the annual movements of the prices received by farmers in the United States for various types of farm products along with the general index of farm prices :

Table VII.

INDICES OF PRICES RECEIVED BY FARMERS IN THE UNITED STATES.

	(1929 = 100).			
	General index	Fruits	Commercial } truck crops ^a	Dairy products
1930	86	115	94	87
1931	60	70	79	69
1932	45	58	68	53
1933	48	52	70	53

^a *I.e.*, market vegetables.

These figures suggest that diversification not only tends to raise agricultural income, but also increases the likelihood of its being maintained during cyclical fluctuations.

55. Moreover, the nutrition of the producer himself is directly improved through this diversification. In the technical conditions of cultivation prevailing in a large part of Europe, a diversification of agriculture is likely to result largely from individual farms increasing the variety of their output, and the increase in the variety of crops produced will make possible an increase in the variety of the diet of the farmer and his household. It would be difficult to exaggerate the necessity for this development.

Elsewhere in this report, statistics are given to show the low level of nutrition prevailing among those engaged in agriculture in several parts of the world. The data available are unfortunately fragmentary and it is to be hoped that they will be improved in the near future; the Health Organisation of the League is taking steps, in conjunction with national administrations, to enquire into

rural nutrition in several countries. Enough is, however, already known to make it clear that—paradoxical though this seems—the deficiencies in the diet of the millions of persons engaged in primary food production are by no means less important than of those engaged in industrial occupations. The disproportion between the prices which the small peasant receives for the crops he puts on the market and the prices he must pay for his modest purchases of industrial goods is frequently so great that, when he concentrates his productive resources on one or two crops, he is unable to supplement his monotonous and one-sided diet by purchasing other food. Any steps which are taken to increase the number of crops produced on such small farms cannot but have a beneficent effect on the producers' nutritional status. In some cases, natural conditions limit the variety of crops which can be produced, but in others conditions are favourable to the production of foods which are notoriously deficient in rural diets. Through education and instruction, much could be done to improve the diet of rural populations in this way.

56. Agriculture may expect to derive still other benefits from the movement towards better nutrition. In most Western-European States, rural depopulation is viewed with considerable misgiving and there is a widespread desire to stop the efflux of young people from the country to the towns. The economical production of dairy produce and of fruit and vegetables requires more labour per unit of land than does the economical production of cereals. Most grains, once sown, require but little attention until harvesting. In dairy-farming, on the other hand, labour is constantly employed in feeding, milking, etc. Vegetables also require much attention. Mixed farming is thus admirably adapted to the family structure of the farm so common in many parts of the world, and a policy of encouraging and facilitating the transition to this form of agriculture, where it is technically possible, would serve the additional purpose of making it possible for larger numbers of people to draw sustenance and profit from agricultural pursuits.

57. Such a policy of facilitating the adaptation of European agricultural systems to the new consumption trends may well bring advantages also to the countries which, through their natural or technical conditions, are best adapted to produce the great staple

foodstuffs. A greater concentration of national agriculture on supplying the increased domestic requirements of liquid milk, fruit, vegetables, eggs, etc., which would result from an improvement in nutritional standards may lead to an expansion of international and intercontinental trade in cereals, sugar, chilled and frozen meat, and butter, with mutual profit to the producing and the consuming countries.

58. The objection is sometimes raised that a deliberate policy of diversification of farming might result in increased dependence on foreign supplies of essential foodstuffs in case of national emergency, and that therefore encouragement should be confined to the production of the high-energy foods, such as the cereals and sugar-beet. It is undoubtedly true that, per unit of land, a larger number of calories for human purposes can, in normal circumstances, be derived from sugar-beet and cereals than from the highly protective foods. Certain considerations, however, weigh on the other side. In particular, it must be observed that dairy-farming and cereal production are not necessarily mutually exclusive alternatives. The method of feeding the animals is the determinant factor. Under the method of "arable animal husbandry" in use in Denmark, the animals are partly fed with cereals which each individual farmer grows himself. It has been shown in Table I above that the change from cereal exporting to specialised dairy production in Denmark involved no reduction in the total production of cereals. Domestic cultivation was indeed intensified, though the type of cereals and the purpose for which they were produced changed. The natural and technical conditions of cultivation (*e.g.*, the amount of rainfall in relation to evaporation, the size of holdings) suggest that "arable animal husbandry" can be much more widely extended to other European countries.

* * *

59. The present chapter has covered a wide field in general terms. It has been argued that agriculture shows an inherent capacity to adapt itself to the changes in the structure of demand, but that certain factors tend to impede such adaptation. The most important influence, other than climate and soil, determining agricultural production—namely, Government measures designed to influence

the prices obtained by the produce—has been left for consideration in the next chapter. It has also been argued that not only world agriculture as a whole, but also the various national agricultural systems, will benefit greatly from an extension of the movement towards better nutrition. The effect of the factors hitherto analysed in general terms on nutritional levels remains to be discussed in detail. The increased food consumption which it is the object of nutrition policy to encourage depends ultimately (measures of social assistance apart) upon the real purchasing power of the consumer and upon his knowledge of the nutritive value of the protective foods and willingness to apply this knowledge. Real purchasing power is a function of prices on the one hand and income on the other. The next chapter is devoted to a consideration of the relationship between prices and consumption, and Chapter 4 to an analysis of the influence on prices both of commercial and fiscal policy and of the natural long-run factors affecting production and distribution. In Chapter 5, an analysis is made of the rôle of income in determining nutritional levels, and the influence of education is analysed in Chapter 6.

Chapter 3.

FOOD PRICES AND CONSUMPTION.

1. The purpose of nutrition policy is to direct consumption, both quantitatively and qualitatively, along the lines which the new science of nutrition has indicated as being conducive to health and efficiency. A necessary prerequisite for such policy is a knowledge of the factors mainly responsible in determining consumption levels and the state of nutrition. Among these factors, it is clear that food prices, incomes and the level of nutritional knowledge play a dominant rôle. The influence of incomes and nutritional knowledge is reserved for separate treatment in Chapters 5 and 6. The present chapter is devoted to an examination of the rôle of food prices in determining consumption levels, while the following chapter indicates some of the main factors influencing food prices on the supply side.

2. The general theoretical relation of prices to consumption is familiar in the form of the "law of demand". A change in the price of any commodity tends to set up two kinds of demand reactions. In the first place, it affects the real income of consumers—raising purchasing power if the price falls, or reducing purchasing power if the price rises. The purchasing power thus gained or lost may lead to an increase or decrease in the consumption, not only of the article whose price has changed, but also of any other articles according to the consumers' scales of desires. In the second place, a change in the price of one commodity alters its cheapness or dearness relatively to other commodities prices of which have not changed, or not changed to the same extent. This second influence is particularly important in the case of commodities for which efficient substitutes are readily available.

3. Price elasticity¹ of demand consists, therefore, of two components: income elasticity—*i.e.*, changes in demand resulting from

¹ *I.e.*, the ratio of proportionate change in demand to proportionate change in price.

changes in income—and elasticity of substitution—*i.e.*, changes in demand resulting from changes in relative prices. Chapter 5 furnishes data regarding the first element. The analysis made in that chapter shows that, in general, the income elasticity of demand is greater for protective foods than for those supplying mainly energy; or, in other words, that consumers, as their incomes rise, tend to increase consumption of protective rather than of non-protective foods. This fact would suggest that the price elasticity of demand for the protective foods is, on the whole, probably greater than for the non-protective foods, except in so far as the elasticities are modified by possibilities of substitution. If, for instance, prices of non-protective foods as a whole fall (relatively, of course, to incomes and other prices), it is not to be expected that their consumption will increase very rapidly, but rather that the purchasing power released will be spent mainly on the protective foods which have a higher elasticity of demand. On the other hand, if the price of only one non-protective food—say, of one cereal—falls in a country where more than one cereal is in common use, a considerable increase in its demand may arise from the substitution of this cereal for the others whose prices have not fallen; in addition, there may be an increase in the demand for protective foods due to the purchasing power set free.

4. The above considerations regarding price elasticities of demand are deduced indirectly from information concerning income elasticities. It is also possible, however, to assess directly the importance of prices in guiding consumption by concrete calculations of price elasticities of demand—*i.e.*, the proportionate change in amounts purchased which, on the average, correspond to given proportionate changes in price. Such calculations of demand elasticities are clearly of central importance for nutrition policy, in particular as regards agriculture. Information in this field is at present very restricted, mainly owing to the inadequacy of consumption statistics, to which attention has already been drawn.

5. A very rough illustration of the relation between retail prices and *per caput* consumption of butter, milk and eggs in a few countries during the ten years 1925-1934 is given in Diagram I.¹

¹ Based on League of Nations: "The Problem of Nutrition", Vol. IV. — "Statistics of Food Production, Consumption and Prices", documentation prepared by the International Institute of Agriculture (Geneva, 1936).

Diagram I.

PRICES AND CONSUMPTION OF BUTTER, EGGS AND MILK.

(1925 = 100.)

A Real price.

B Consumption.

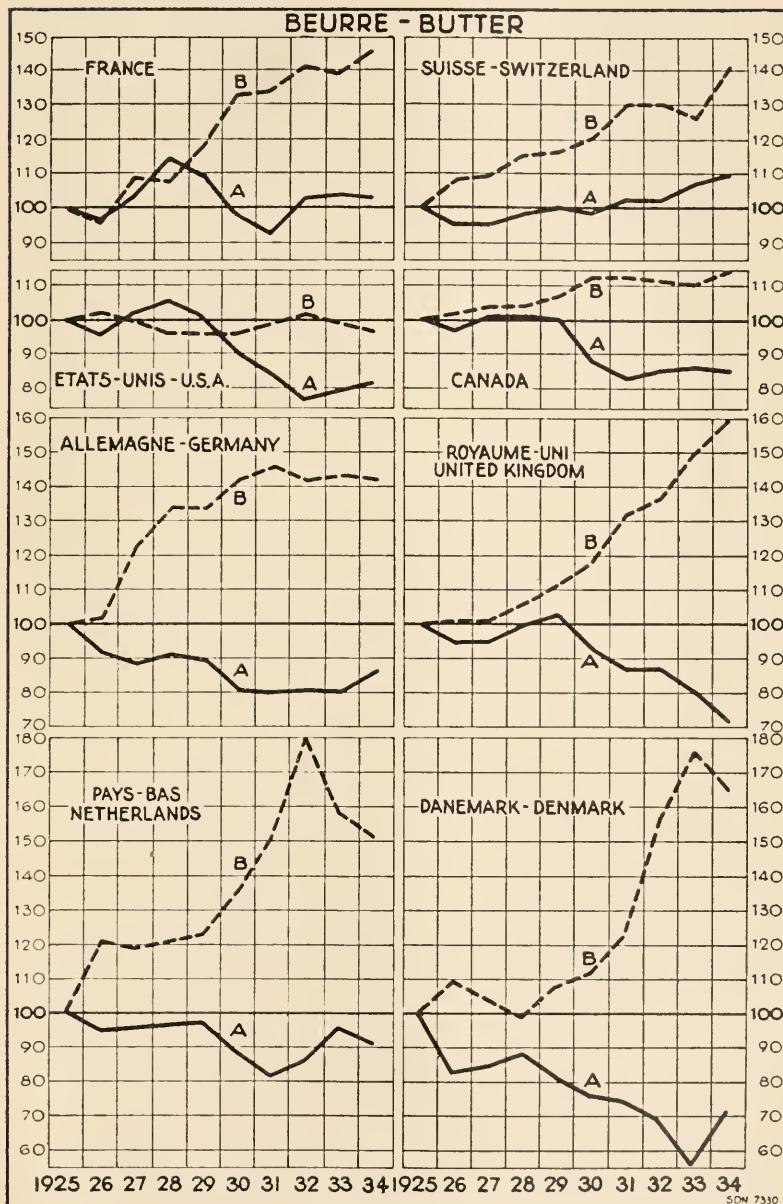


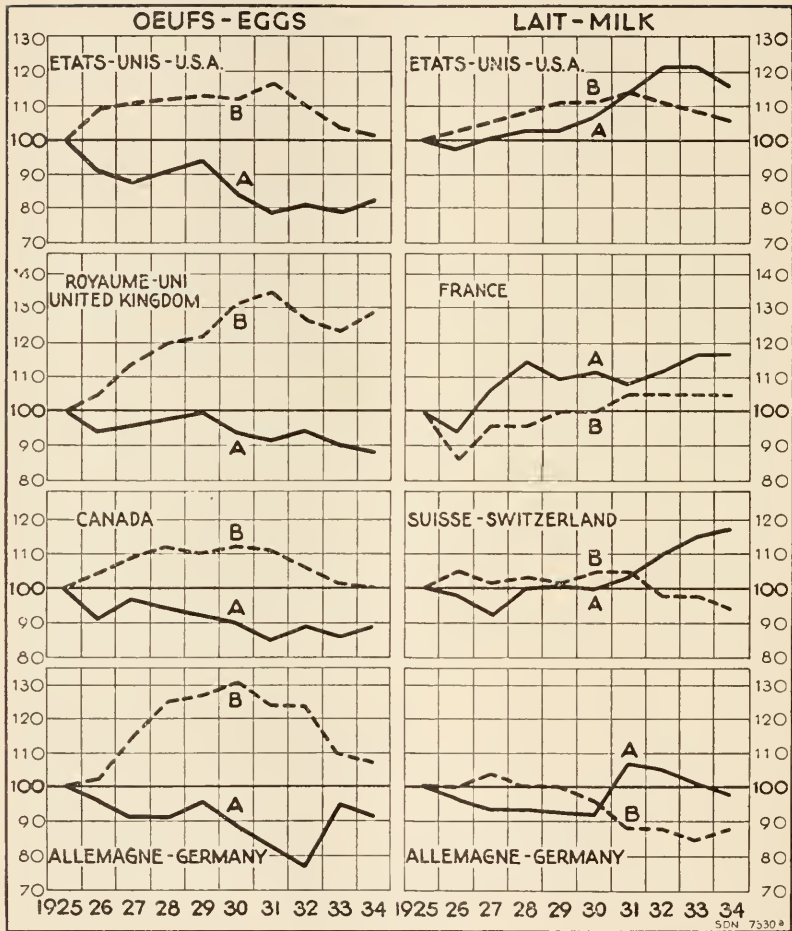
Diagram I (continued).

PRICES AND CONSUMPTION OF BUTTER, EGGS AND MILK.

(1925 = 100.)

A Real price.

B Consumption.



Influences on consumption other than price are disregarded, and the retail price of each commodity has been deflated by an index of all retail food prices. The price curve, that is to say, does not show the changes in the actual retail prices of the commodities in question, but in the relationship between their prices and the prices of all foods; in short, it shows the changes in the "relative"

and not the "absolute" dearness of the foods covered. In spite of over-simplification and of the roughness of the national consumption estimates, a fairly clear negative price elasticity—an inverse relation between prices and consumption—can be seen in most cases. The elasticity appears, on the whole, to be greater, and the correlation better, in the case of butter than in that of milk and eggs, probably owing to the greater possibilities of substitution in the former case. It may be noted that elasticity of demand for butter tends to be less in countries, such as Canada, where the *per caput* consumption is already high and where the main substitute, margarine, is not available.

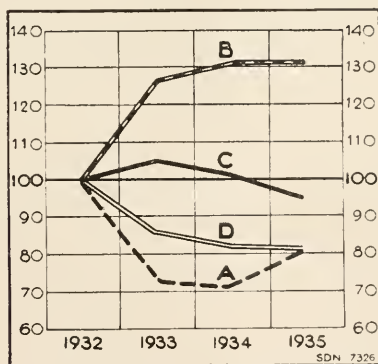
A clear relation between prices and consumption of oranges and bananas in Sweden is shown in Diagram II below.¹

Diagram II.

PRICES AND CONSUMPTION OF ORANGES AND BANANAS
IN SWEDEN.

(1932 = 100.)

- A Consumption of bananas.
- B Consumption of oranges.
- C Price of bananas } deflated by total
- D Price of oranges } food cost index.



Similarly, the effect of prices on the consumption of milk, beef, pork, sausages and sugar by families of workers in Vienna can be seen distinctly in Diagram III. The consumption data have been obtained from family consumption studies of the Chamber of

¹ Data taken from *Statistik Årsbok*, 1936. Net imports were used for consumption.

Labour and relate to twenty-two identical families which kept records continuously from 1927 to 1934; the prices are those actually paid on the average as ascertained by dividing the expenditure incurred by quantities purchased, and they have been deflated by the cost-of-living index for Vienna.¹

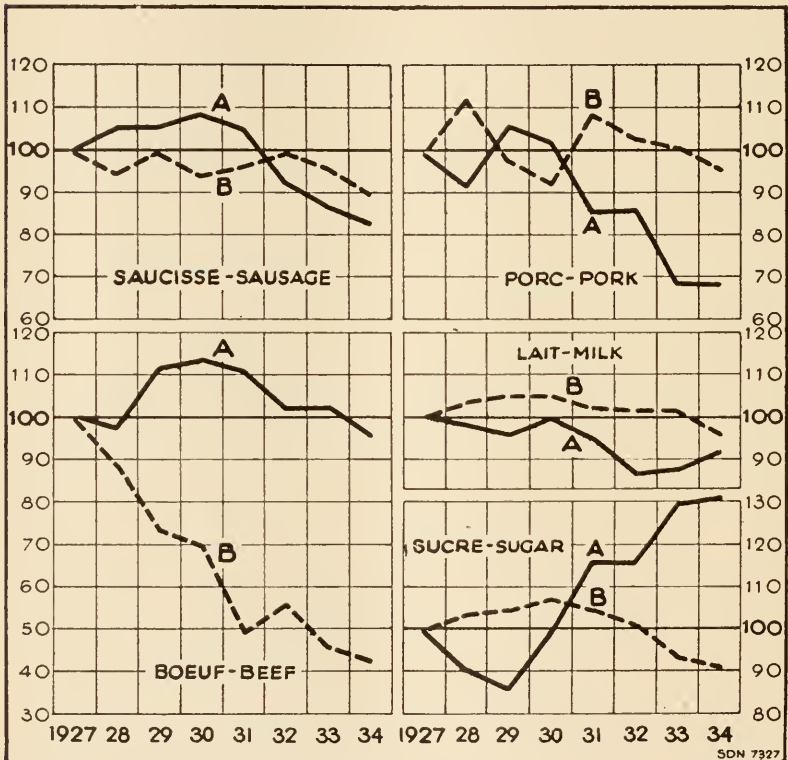
Diagram III.

PRICES AND CONSUMPTION: WORKERS' FAMILIES IN VIENNA (1927-1934).

(1927 = 100.)

A Real price.

B Consumption.



6. Another rough indication regarding price elasticities can be obtained from observations in local communities of prices and sales of large, well-established retail stores, which serve a substantial

¹ "Kammer für Arbeiter und Angestellte in Wien", *Wirtschaftsstatistisches Jahrbuch*, 1936, Table 169.

proportion of the demand of a district. The following examples supplied by local consumers' co-operative stores in Austria provide some interesting evidence on the relation of retail prices to sales of a few foodstuffs.

Table I.

PRICES AND SALES IN CO-OPERATIVE STORES (AUSTRIA).

Consumers' Co-operative in Lower Austria.

	Prices Schillings	¹⁹³⁴ Sales Kg.	Prices Schillings	¹⁹³⁵ Sales Kg.
Apples	0.34	68,700	0.55	45,500
Beans (Wachtelbohnen) . .	0.53	6,200	0.48	9,400
Apple jam	1.80	720	1.60	1,360
Flour	0.72	355,600	0.74	332,300

Consumers' Co-operative in Carinthia.

Lard	2.53	62,048	2.60	59,643
Vegetable fat and dripping	1.84-2.00	7,995	1.79-1.87	16,459
Salad oil	1.35	80,649	1.34	86,652
Maize	0.36	314,323	0.38	292,825

7. A number of investigations concerning the elasticity of demand for certain foodstuffs have been made with more refined statistical tools. Table II¹ gives a summary of the results of a few such investigations. When an elasticity is shown as 1, it means that it has been found that a reduction of, say, 10% in price led, on the average, to an increase of about 11% in demand, such that the total value of sales remained always constant; and similarly in the case of an increase in price. When an elasticity is greater than 1, it means that the proportionate change in demand was found to be greater than the proportionate change in price, so that a fall in price led to an increase, and a rise in price to a decrease, in the total value of sales; where it is less than 1, the opposite was found to be true.

8. In view of the small number of calculations relating to any one commodity, and of the divergencies in time, place and method of the calculations, caution is required in drawing conclusions from the above table. It may be noticed, however, that, of the protective foods included, fresh eggs showed a very high elasticity of

¹ Professor J. TINBERGEN, " L'élasticité de la demande des produits des industries agricoles ", Congrès international des Industries agricoles, Scheveningen, 1937.

Table II.
Calculations of Elasticity of Demand.

Commodity	Country	Period	Source	Other factors included in calculations and remarks on methods ^a	Elasticity
Fresh butter	Netherlands	1929-1930	<i>Ned. Conj.</i> , Dec. 1931, page 22	Seasonal variations. Wholesale prices used	<i>Circa</i> . . . 1 Summer . . . 0.8 Winter . . . 1.6
Fresh eggs	Netherlands	1930	<i>Ned. Conj.</i> , March 1931, page 29	Seasonal variations. Wholesale prices used	<i>Circa</i> . . . 2 Spring . . . 0.9 Autumn . . . 7.0 <i>Circa</i> . . . 2.5
Pork	Netherlands	1924-1934	<i>Ned. Conj.</i> , May 1935, page 15	Income and beef prices (both deflated by cost of living)	<i>Circa</i> . . . 1.2
Beef	Netherlands	1921-1934	<i>Ned. Conj.</i>	Income and pork prices	0.3
Sugar	Netherlands		Weinreb Stat. be- paling v.d. vraag-curve	Income. Several methods used for deflating prices and incomes and for determination of trends	
Potato flour	Netherlands (exp.)	1921-1930	<i>Ned. Conj.</i> , March 1933, page 22	Potato crop in competing countries ; general economic activity	0.5-1.7 1.2-4.7
Potato flour	Netherlands (ex- ports to U.S., U.K. and Bel- gium)				
Beef	United States	1922-1933	SCHULTZ, J. P. E., 1935, page 4	Income; prices of pork and mutton. All deflated by cost of living	0.83
Pork	United States	1922-1933	SCHULTZ, J. P. E., 1935, page 4	Income; prices of beef and mutton. All deflated by cost of living	0.70
Mutton	United States	1922-1933	SCHULTZ, J. P. E., 1935, page 4	Income, prices of beef and pork	1.9
Sugar	United States	1890-1914	SCHULTZ, J. P. E., "Stat. Laws of Supply and De- mand"	Trend eliminated. Prices deflated by wholesale-price index	0.5
Potatoes	{ Belgium (workers only)	1891-1932 ^b	STAEBLE (unpub- lished)	Prices deflated by cost of living (family budget data used)	^c 0.09 1.27
Sugar					
Butter	{ Great Britain	1923-1933	R. COHEN, "The History of Milk Prices"	Real income	<i>Circa</i> . . . 1 1933 . . . 0.5 1924 . . . 1.6 1923 . . . 0.6 1933 . . . 0.3
Cheese					

^a *I.e.*, in addition to quantities and prices (retail). ^b Only for five separate years in which family budget enquiries were made. ^c The elasticity here was positive, showing an increase in price to give rise to an increase in demand.

demand, and butter an elasticity of about 1 in both examples. The relatively high meat elasticities are probably related to the considerable substitution possibilities. Of the non-protective foods included, sugar shows a fairly low elasticity in two out of the three examples, and potatoes even show a positive elasticity—*i.e.*, a rise or fall in price was found to be accompanied by a movement of consumption in the same direction. Other calculations regarding non-protective foods have been made by Professor SCHULTZ,¹ which show, on the whole, low price elasticities; he obtained the following elasticities for wheat, sugar and potatoes in the United States at three consecutive periods:

	1875-1895	1896-1914	1915-1929
Wheat	0.13	0.01	0.27
Sugar	0.38	0.27	0.31
Potatoes	0.66	0.27	0.31

In every case except one covered in the table on page 191 a negative elasticity was found—*i.e.*, a fall in price led, *ceteris paribus*, to an increase in the amount demanded, and *vice versa*. The one exception was the very small positive price elasticity for potatoes already mentioned. Apart from the possibility of a change in tastes, this could be explained by the fact that a fall in the price of potatoes enabled Belgian workers to satisfy their most pressing hunger more cheaply than before, so that money became available for the partial replacement of potatoes by other foods. Similarly, a rise in potato prices involves a fall in real income, and may be accompanied by the increase in the relative or absolute consumption of potatoes, which is a not unusual accompaniment of a reduction in real income.²

9. Several different methods of establishing demand curves are represented in the above list. Most calculations have been based on national consumption figures and retail (or occasionally wholesale) prices. Two, however, have made use of family budget data; families with "equivalent incomes" (established by means of a special cost-of-living index³ have been selected from successive

¹ Professor H. SCHULTZ: "The Shifting Demand for Selected Agricultural Commodities, 1875-1929", *Journal of Farm Economics*, April 1932.

² An analogous case of a positive price elasticity for margarine in Germany was pointed out by SINGER and ROSS (*Inst. d'Hyg. de l'Univ. all. de Prague*, t. II, 1932).

³ The method of calculating equivalent incomes at different periods is described by H. STAEBLE in "A Development of the Economic Theory of Price Index Numbers", *Review of Economic Studies*, June 1935.

family budget enquiries, and the relation between retail prices and the consumption of these families has been observed. This method makes it possible to calculate the elasticities of demand pertaining to different income groups, which is likely to be of more importance for nutrition policy than the elasticity for the market as a whole; the method is, however, applicable only in countries where extensive family budget studies have been made at fairly close intervals, since otherwise changes in taste may obscure the true price elasticity.

10. In explaining the consumption of any particular article of food, other factors besides its own price may play an important rôle. Among the main factors to be taken into account are the distribution of families by income and the prices (or supplies) of goods whose consumption is related to that of the commodity in question. Changes in tastes leading to a long-term shift in the whole demand curve may be taken into account, either by introducing "time" as a specific variable or by eliminating a trend in other variables.¹

11. The diagram on the opposite page shows total demand curves for butter and cheese in the British market, after the influence of income has been eliminated:²

The studies made showed that, during the period covered, whatever the price prevailing, a rise or fall in the price of butter of 1d. per lb. decreased or increased demand, on the average, by the same *absolute* amount—39,000 cwt.—and that a rise or fall in the price of

¹ Cf. Henry SCHULTZ: "The Shifting Demand for Selected Agricultural Commodities, 1875-1929", *Journal of Farm Economics*, April 1932.

² From R. COHEN, "The History of Milk Prices", Oxford, 1936. Data covering the years from 1923 to 1933 yielded the following multiple correlation equations:

$$P_B = 20.0374 - 0.002559 Q_B + 0.1634 M$$

$$\text{and } P_C = 23.4626 - 0.007496 Q_C + 0.17544 M$$

where P_B and P_C represent the price in pence per lb. of salt butter and cheese respectively; Q_B and Q_C the total supplies of butter and cheese in thousand cwt. and M an index of spending power (1933 = 100). To obtain the influence of price on consumption by itself, the 1933 value of the purchasing power index was inserted in each equation, and the retail prices from 1923 to 1933 corrected to allow for changes in purchasing power during the period. The resulting demand curves were

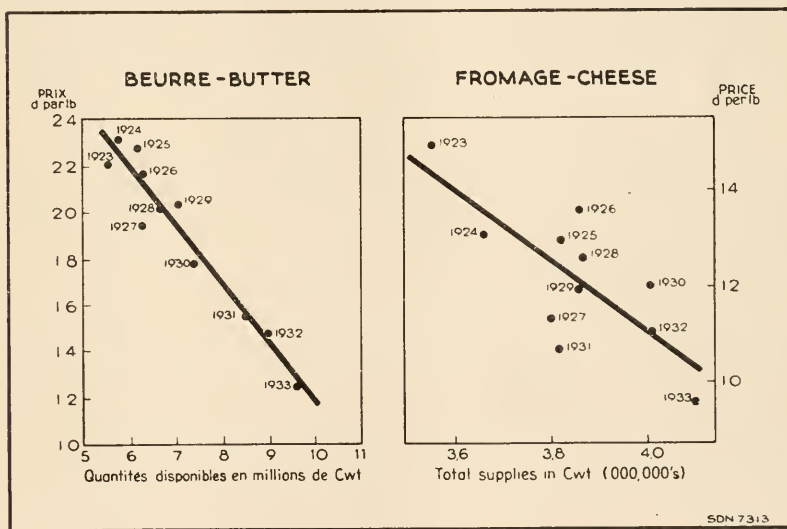
$$P_B = 37.2780 - 0.002559 Q_B$$

$$\text{and } P_C = 41.0067 - 0.007496 Q_C$$

cheese of 1*d.* per lb. decreased or increased demand, on the average, by 133,000 cwt. Since the change provoked by a given change in price remained constant whatever the absolute level of consumption, it is obvious that the *elasticity* (*i.e.*, relation of proportionate change in demand to proportionate change in price) was greater when total consumption was relatively low (and prices high) than when total consumption was relatively high (and prices low). It may be presumed that the greater the consumption the nearer has satiation-point been reached, so that the less is the inducement to increase purchases as a result of lower prices, and conversely the greater the tendency to reduce purchases as a result of higher prices.

Diagram IV.

RELATION BETWEEN RETAIL PRICES AND TOTAL SUPPLIES OF BUTTER AND CHEESE WHEN SPENDING POWER IS MAINTAINED AS IN 1933 (UNITED KINGDOM 1923-1933).



12. Little exact information is available regarding the elasticity of demand for milk, but, in general, the response of consumption to changes in price has been found to be fairly low. In New York City between 1919 and 1924, it was recorded that eleven decreases of 1 cent per quart in the retail price of the staple type of milk retailed (an average price change of 6½%) were followed by

average increases in the sales of six of the largest distributors of only 0.6 % of normal sales; in the same period, ten price increases of 1 cent (representing an average price change of 7 %) were followed by decreases of sales of only 0.4 % of normal sales. It appeared, however, that, when the price rose above a certain level (about 17 cents per quart), a sudden increase in elasticity occurred; a price rise of 2 cents to 18 cents per quart was on one occasion followed by a decline in consumption by 6.5 % of the normal level, and a rise in price of 1 cent (also to 18 cents) was on another occasion followed by a fall of 5 % in demand.¹

13. So far as can be gathered from the very sparse data available, the elasticity of demand for liquid milk in England appears to be somewhat greater than that in the United States. This is probably related to the relatively low *per caput* consumption in the former country. "A number of large retailers state that the spring fall of 1*d.* a quart usually stimulates their sales by anything from 5 to 20 %, this increase being lost again in winter".² Part of this reaction may be due to a seasonal change in demand unrelated to price.

The Milk Reorganisation Commission Report³ expresses some doubts regarding the apparent inelasticity of demand for milk in England. It points out that the long-term effects of price changes are probably greater than suggested by the recent maintenance of demand in the face of an increase in milk prices.

"Any increase in the retail price of milk is bound to be a matter of moment to consumers, and particularly to those whose budget allowed for only a small quantity of fresh milk even before the rise in price. The price increases have necessarily had their greatest effect on the poorest consumers—that is, on those whose consumption was already far below the general standard for the country".⁴

¹ H. A. ROSS: "The Demand Side of the Milk Market". Bull. 450, Cornell University Agricultural Experiment Station, 1927; quoted in R. COHEN, "A Survey of Milk Marketing Schemes and Price Policies", Univ. of Cambridge, Dept. of Agriculture, Farm Economics Branch Report No. 20, 1933.

² R. B. FORRESTER: "The Fluid Milk Market in England and Wales". Min. of Agriculture and Fisheries, Economic Series, No. 16, 1927, page 109.

³ Ministry of Agriculture and Fisheries, Economic Series No. 44, 1936.

⁴ *Op. cit.*, pages 109 and 110.

"The [Consumers'] Committee has expressed to us the opinion that a reduction in the price of milk would lead to increased consumption and that, in view of the benefits that such increased consumption would have on the health of the community, every endeavour to this end should be made."

It would nevertheless appear that, in view of the vital importance of assuring an adequate level of milk consumption, too much reliance should not be placed on price policy as a means of stimulating demand. Other methods, in particular publicity and free or subsidised distribution of milk to certain sections of the community, may be called for to supplement and reinforce the policy of reducing milk prices.

14. The availability of substitutes for fresh milk and cream, such as condensed or dried milk and tinned cream, may tend to increase their elasticity of demand. An example of the substitution of skimmed for full milk following a price increase is reported from a local Consumers' Co-operative Society in Graz, Austria.

Table III.

PRICES AND SALES OF FULL AND SKIMMED MILK (GRAZ, AUSTRIA).

	<i>Full milk</i>		<i>Skimmed milk</i>	
	Price Groschen	Sales Litres	Price Groschen	Sales Litres
1933	36	230,000	10	—
1934	42	112,000	10	1,635
1935	42	81,000	10	4,204
1936	42	79,000	10	12,222

15. The importance of the elasticity of substitution in another sphere may be illustrated by the reactions of consumers to changes in the relative prices of various meats.¹ Beef, mutton and pork serve roughly similar purposes, both from the point of view of nutrition and from that of the palate. The responses of consumers to changes in meat prices in the United States and in Canada are shown in Diagram V below.

16. The more perfect the substitute, the greater the elasticity of demand. Diagram VI shows the influence on consumption of movements in the relative price of two sorts of butter (almost perfect substitutes) sold in the United Kingdom.

¹ See also Part III, Chapter 1, paragraph 27, above.

Diagram V.

PRICES AND CONSUMPTION OF VARIOUS MEATS.

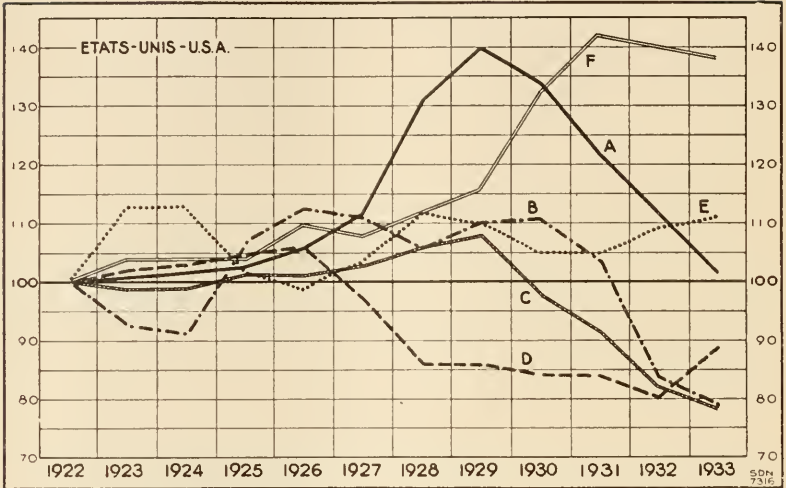
Prices deflated by total
food cost index:

- A Beef and veal
- B Pork
- C Mutton and lamb

Consumption:

- D Beef and veal
- E Pork
- F Mutton and lamb

(1922 = 100.)



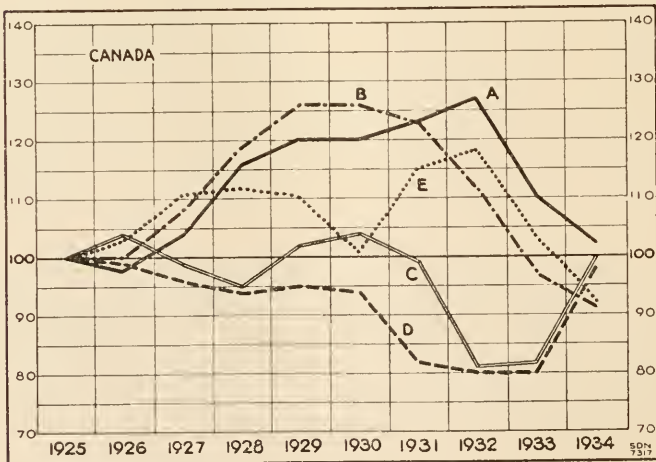
Prices deflated by total
food cost index:

- A Beef
- B Veal
- C Pork

Consumption:

- D Beef and veal
- E Pork

(1925 = 100.)



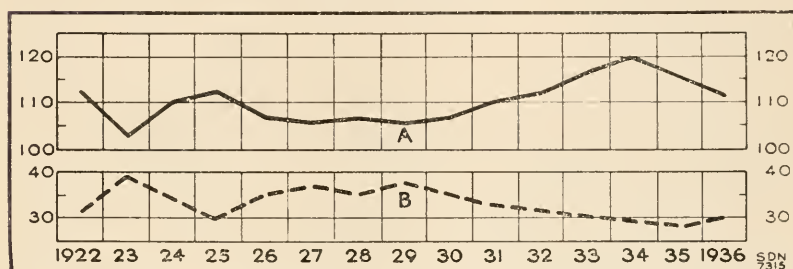
It appears that, whenever the price of Danish and Dutch butter rises relatively to that from Australia and New Zealand, the butter imports from Denmark and the Netherlands show a relative fall and

Diagram VI.

PRICES AND CONSUMPTION OF EMPIRE AND FOREIGN BUTTER
IN THE UNITED KINGDOM.

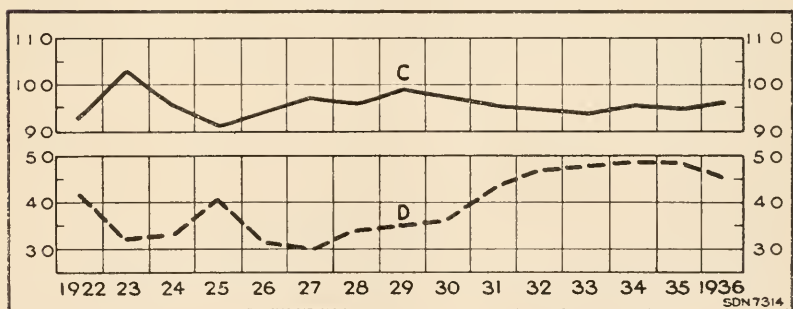
A $\frac{\text{Average of prices of Danish and Dutch butter}}{\text{Average price of all butter.}}$

B $\frac{\text{Butter imports from Denmark and the Netherlands}}{\text{Total butter imports.}}$



C $\frac{\text{Average of price of Australian and New Zealand butter}}{\text{Average price of all butter.}}$

D $\frac{\text{Butter imports from Australia and New Zealand}}{\text{Total butter imports.}}$



those from Australia and New Zealand a rise; the contrary movement follows a fall in the relative price of Danish and Dutch butter. The fact that, in spite of the good correlation, the elasticity is not higher implies that consumers either do not regard European and Australasian butter as exactly the same commodity, or else that they are slow to react to changes in relative prices.

17. The influence of prices on consumption is of importance in connection with seasonal differences in diet. Certain foods, particularly those of high nutritive quality, such as dairy products, fruit and vegetables, are subject to considerable seasonal fluctuations in supply and price. The result is frequently to produce variations in the consumption of important nutrients which by no means correspond to changes in physiological requirements.

Diagram VIII shows the seasonal movement of the prices paid and of the consumption of butter and eggs by workers and officials' families in Prague.¹ It may be noted that more extreme seasonal fluctuations appear in the butter consumption of workers than in that of officials.

It would appear possible to iron out to some extent excessive seasonal movements in consumption by improved methods of conservation and storage and by spreading information both regarding these techniques and regarding seasonal price movements.

18. The responsiveness of consumption to changes in prices may be different according to the direction in which the change takes place. Situations may arise where, for instance, a small reduction in price leads to a considerable expansion of consumption, but where a subsequent rise in price is not followed by a corresponding fall in consumption. The reason may be that a habit has been formed, so that deprivation of the commodity has become a greater hardship than before the pleasures of increased consumption had been tasted.

19. It is clear that elasticity of demand in general can be influenced to a considerable degree by nutritional education of consumers. It may be expected that, as a realisation of the essential nature of the nutritive qualities of protective foods becomes widespread among the consuming public, not only will the absolute amount of their consumption increase, but also its elasticity will become less—*i.e.*, consumption will be less likely to fall off as a result of small rises in price. So long as fruit and fresh vegetables are regarded as delicacies, and butter merely as a slightly better tasting equivalent to margarine, one may expect a sharp shrinkage in demand to follow a rise in the prices of these

¹ From *Mitteilungen des Statistischen Staatsamtes der Tschechoslowakischen Republik*, 1931, Nos. 33-36.

Diagram VII.

SEASONAL MOVEMENT OF PRICES AND CONSUMPTION: BUTTER AND EGGS.

Czechoslovakia.

Consumption per consumption unit for:

A Officials.

C Workers.

Price paid by:

B Officials.

D Workers.



commodities; but, if it is realised that these foodstuffs serve to build up resistance to disease and promote general health in a way that other, cheaper foods do not, efforts will be made, in so far as incomes permit, to meet a rise in their prices by economising on other less vital expenditures.

In short, with an expansion in the consumption of protective foods to more nearly adequate levels, and with the spread of nutritional knowledge, it may be expected that the elasticity of demand for protective foods will grow to resemble more closely that of the non-protective foods.

20. The elasticity of demand is dependent partly on the level of income.¹ The type of dependence will, however, vary according to the nature of the commodity. In the case of most foodstuffs, where satiation tends to be reached at relatively low incomes, it may be expected that elasticity will decrease with increasing consumers' incomes. For commodities for which efficient substitutes are available, however, elasticity might be greater for higher incomes, where expenditure is spread over a larger range of items, thereby increasing the scope for substitution.²

21. The fact that elasticity of demand for protective foods is likely to be higher among the lower-income groups of the community, and that it is precisely these groups which are in most danger of malnutrition, suggests that consideration should be given to the possibility of discriminating prices as a means of stimulating consumption in certain cases. It may be that a small reduction in the general price of milk would not lead to an appreciable expansion of consumption, while a somewhat larger reduction applied to a small section of the market whose milk consumption was particularly inadequate might have better results, at the same, or even less, cost to producers or to the State. This consideration has led authorities in several countries to supply milk at much reduced prices to children in schools, to nursing and expectant mothers, or to the unemployed. For instance, a scheme for

¹ It is for this reason that particular importance should be attached to methods of calculating the elasticity of demand, such as that mentioned in paragraph 9 above by means of which the elasticities referring to specific income levels can be obtained.

² Cf. BOWLEY and ALLEN: "Family Expenditure" (London, 1935, page 125).

supplying milk to children and mothers in a depressed area (Rhondda Valley) in Wales at 2*d.* per pint is financed by reducing the distributors' margin from 10*d.* to 8*d.* per gallon and granting a subsidy of 3½*d.* per gallon from the Commissioner for the Special Areas. In the Netherlands, preserved meat, margarine, fresh vegetables and fish have been distributed to the unemployed at prices considerably below those ruling in the market. In the United States, the principle of "class prices" has been introduced in several fields of the economy.

Price discrimination may be financed by subsidy, by charging higher prices on part of the sales, or by a differentiation of presentation or of the service of distribution. Thus, bread or milk may be sold more cheaply over the counter than when delivered at the door.

Chapter 4.

FACTORS INFLUENCING FOOD PRICES.

A. INTRODUCTORY.

1. In the previous chapter, some indications have been given of the influence of food prices on consumption; it remains now to consider the main factors determining the level of food prices.

2. In general, price may be regarded as an index of the degree to which potential demand for a commodity can be satisfied by the available sources of supply. The previous chapters have shown the influence of a number of factors affecting the potential demand for certain foodstuffs (for example, movements of incomes, an increased desire for "protective foods" and a relative or absolute decrease in the demand for non-protective foods) and, at the same time, other factors affecting the availability of supplies (for example, technical progress in production and transport, developments in commercial policy, etc.). These influences on the supply and demand side have reacted mutually on one another through the medium of price. In Chapters 5 and 6, the income and education influences on the demand side are discussed. In the paragraphs which follow, a brief account is given of the factors determining the conditions of supply of foodstuffs. These may be roughly classified under four heads: technical costs of production; commercial policy; production and price policy; and costs of distribution (including marketing and transport).

B. EFFICIENCY AND COST OF PRODUCTION.

3. In Chapter 3, it has been demonstrated that lower food prices to the consumer (*i.e.*, cheaper calories) tend—money incomes and other things being equal—to result in an increase in the consumption of protective foods, while higher food prices are likely to have the opposite effect. It by no means follows from this demonstration, however, that the way to secure a general all-round improvement in nutritional standards is to force down the price

which farmers and other producers of primary foods get for their products to non-economic levels. Farmers also eat; and no one would wish that they should eat less or worse in order that the industrial population eat better. Moreover, from the point of view of general welfare, the prosperity and purchasing power of the buyers of food are intimately bound up with the prosperity of the producers of food. If the latter have their incomes cut through reductions in price uncompensated by reductions in cost, they are clearly less able to buy industrial goods; and the employment, income and nutrition of industrial workers are likely to be adversely affected. If cheap food were in itself a panacea, the years 1930 to 1933 would have represented a millennial period in many countries.

4. It may therefore be taken as axiomatic that a comprehensive and well-considered nutrition policy should not be of a nature to cause losses to food producers, nor should its effect be to force the prices of food products below levels which cover the costs¹ of the marginal producer whose output is required to meet current demand and give him a fair return on his labour and investment.

5. The income of the producer depends upon the relationship between the price he obtains, his costs of production, including fixed charges and taxation, and his volume of sales. The return to the farmer will fall if prices decline as a result of "external" factors or if costs are increased. One of the main factors bringing about the drastic fall in agricultural prices during the depression was the cumulative falling-off of monetary demand; it would seem to be an important task of policy to prevent excessive fluctuations in producers' prices originating in this way. Among the factors tending to increase costs in recent years, special reference must be made to the burden of taxation. Fiscal policy necessarily plays an important part in influencing producers' costs and consequently food prices. Where a fall in prices is due, not to a shrinkage of demand, but to increased production accompanied by a reduction in costs, no loss to the producer is involved. On the contrary, the consumption of his product is likely to rise with the reduction in price: more will be sold and the return to the producer will be increased.

¹ The problems raised by the differences in costs of production in different countries are reserved for separate treatment in the next section.

6. It is therefore clear that, from the point of view of nutrition policy, as well as from the point of view of the interests of agriculture, great importance is to be attached to any steps which can be taken to increase the efficiency of food production and distribution and so enable food prices to be lowered without reducing the net return to the producer. The factors determining efficiency and cost of production are varied and complex; and it is not possible to do more than stress the importance of this question here. In the previous chapters, several examples have been given of remarkable improvements in agricultural methods which have occurred in recent decades. The effect of these improvements is to reduce costs and make greater supplies available at a given price than previously. There remains great scope for the application of scientific knowledge and the increased use of fertilisers in agriculture in practically all parts of the world. Through encouraging improvements in agricultural technique, Governments and agricultural co-operative societies can make an important contribution to raising general nutritional levels.¹ In this connection, the education of the agricultural population is of primary importance. The countries where the greatest advances in efficiency have been made in recent years are those, such as Denmark, where the standard of education among the rural population attains a very high level.

C. COMMERCIAL POLICY.

7. In addition to efficiency of production, the conditions under which foreign food supplies are allowed to enter national markets constitute an important influence on food prices. These conditions as expressed through commercial policy, determine the extent to which such benefits as can be obtained from the international division of labour in food production may be enjoyed by consumers in general.

8. It would go beyond the scope of this report to attempt to give a detailed account of the development of the international trade in foodstuffs and of the interferences with that trade. Differences in the efficiency and cost of agricultural and other

¹ For an exposition of the important part played by agricultural co-operative societies in increasing the output and improving the quality of certain foods, see International Inter-Co-operative Committee: "The Co-operative Movement and Better Nutrition" (published by International Labour Office, Geneva, 1937).

forms of primary production in different parts of the world led to a great expansion of the trade in basic foods in the course of the nineteenth century and early twentieth century; with the development of transport and refrigeration, supplies could be drawn from parts of the world where natural or technical conditions were most favourable. It has been argued in Part III, Chapter I, above that this broadening of the area of supply was one of the principal factors accounting for the improvement in nutrition standards in Europe. One need only consider the influence which the international trade in wheat, meat, butter and citrus fruits exercised on the standards of consumption in some countries to be impressed with the importance of this factor.

9. In many European countries, however, the cheap foreign supplies were regarded as threatening the stability of domestic agricultural systems, and protective tariffs against food imports began to spread on the Continent in the last quarter of the nineteenth century. Thus, the German tariff of 1879 imposed greatly increased duties on grain and live-stock. A moderate tariff instituted in France in 1881 soon gave way to higher duties on wheat, other cereals, flour, live-stock and meat. Italy, Austria-Hungary and Switzerland all protected their agricultural systems. The United Kingdom stood clear of the protectionist movement until recent years. Denmark, maintaining a system of free trade except for cheese, shifted from cereal to dairy production and animal husbandry; her example was followed by the Netherlands—where low duties were imposed on food imports, while grains, feeding-stuffs, bacon, pork and mutton were admitted free—and, to a lesser extent, by Belgium, where a low tariff was imposed, favouring live-stock. Towards the beginning of the present century, world prices of agricultural produce started to rise rapidly, and there was no noticeable increase of agricultural protection in Europe in the decade preceding the great war.

10. Though agricultural protection is not a new phenomenon, food duties in pre-war and immediate post-war Europe must be characterised as moderate compared with the situation which has developed during the past decade. Not only have import restrictions become much more severe in the countries which formerly afforded a limited protection to their food-producers, but the

United Kingdom, the Netherlands, Denmark and Belgium have abandoned their traditional low-tariff or free-trade policies.

It is difficult to set an exact date to the beginning of the present phase of agricultural protection in Europe: the principal development occurred during the period of economic depression beginning in 1929; but the tendency can be discerned as early as 1925. When Germany regained her full tariff autonomy in that year, she reimposed high duties on food imports, and these were continually raised during the next four years. French duties on agricultural products were raised in 1926 and 1927; Italy reimposed a wheat duty in 1925, which was raised in subsequent years.

II. After the middle of 1929, restrictions began to multiply and spread. The facts regarding the recent development of agricultural protection are so well known that it is unnecessary to recount them in detail. The Economic Committee of the League of Nations has recently studied this question, and the following passages are extracted from its report: ¹

"For several years after the close of hostilities, Europe continued to import considerable quantities of agricultural products—particularly cereals and meat—her return to her former productive capacity having been retarded by a series of concomitant causes, such as the Russian revolution and numerous agrarian reforms.

"But directly her producing capacity was again restored, about 1925, the balance between supply and demand was broken; prices were already on the downgrade, and the full force of the collapse was felt from 1930 onwards.

"Exporting countries with a surplus of goods had to bear the full shock of this catastrophe, against which they possessed only one means of defence—a useful means at first, but one which was later to constitute an additional danger—namely, to slow down the marketing of their crops by accumulating stocks.

"On the other hand, agricultural producers in the importing countries with a shortage of crops were obliged to appeal to their Governments and to national solidarity in order to escape the contagion. This means they have used, and abused: the introduction of duties two or three times higher than world prices, ever stricter rationing, the progressive reduction to close upon vanishing-point of the proportion of foreign products admitted in the various preparations, bounties for production, export bounties, 'schemes', monopolies and various other forms of planned economy.

"These Draconian measures, which, quite apart from the disorder which they caused in the delicate and complex mechanism of the balance of international accounts, tend to create as many different price regimes as there are protectionist countries and thus delay a return to the essential system of non-watertight

¹ League of Nations, Economic Committee: "Considerations on the Present Evolution of Agricultural Protectionism" (Geneva, 1935).

compartments, were followed by a whole series of difficulties, perhaps less serious but almost as irksome. Quotas have to be allocated as between the countries; hence the danger of discrimination. Quotas have to be allocated as between the traders, and allocation is necessarily synonymous with delay, confusion, error, abuse, *de facto* monopoly and sometimes corruption. The whole body of sanitary measures, applied with the utmost severity, creates a suspicion that those measures have economic objects, and one cannot understand why international co-operation, which is making such strides in the matter of human hygiene, should remain powerless in regard to animal hygiene.

"The consequence of all these measures, applied more particularly by the big industrial countries, was naturally a big-scale reduction, amounting in some cases to the total exclusion, of agricultural imports, and that more particularly in the case of products—such as wheat, meat and butter—playing a fundamental part in the economic life of the producing countries.

.....
"Had it achieved its object, it would be difficult indeed to criticise [this policy]; but facts are to hand which prove that this exaggerated policy of protectionism, spreading from one country to another, is tending to prolong the depression which it was designed to combat and to prejudice the interests of the classes that it aimed at protecting. In its present extreme form, it no longer has anything in common with a moderate protectionism, which is quite compatible with the normal functioning of international trade.

.....
"With the advent of the economic depression which set in in 1929, the majority of countries, threatened by the complete breakdown of international economic equilibrium, sought a remedy in the application of methods which were useful only when they did not exceed certain limits. There thus ensued, first, a progressive increase of duties, followed by the establishment of a system of restrictions practically excluding all imports of certain important agricultural commodities.

"The inevitable consequences of these methods were not slow in making themselves felt. Several important countries which in previous years had still imported large quantities of wheat and other cereals increased their production so as fully to cover their requirements. Often, indeed, they found themselves with large excess amounts, which led to the collapse of prices and obliged the Government to dip into State funds again in order to constitute stocks, give bonuses for denaturation, export, etc. Millions are being spent in this way because, having benefited for a long time by artificially increased prices, the farmers have naturally been led to increase by every possible means a production thus privileged.

.....
"On the basis of post-war experience, it is safe to affirm, without fear of contradiction, that an industrial country, which always requires to maintain the closest relations with other countries, will never be in a better position than if it succeeds, by means of moderate protection, in keeping the prices of the chief agricultural commodities, and particularly wheat, at a reasonable level which will prevent over-production and enable it to retain the ample possibilities in regard to agricultural imports. This policy is undoubtedly the wisest, both in time of peace and in anticipation of possible conflicts."

12. The principal motives behind the recent increase in restrictions on food imports have been the desire to defend national agricultural systems and maintain the farmers' income; the safeguarding or improvement of trade—in some cases with a view to securing an export surplus in order to pay the service of foreign debts, and in others to protect the foreign-exchange reserves and prevent currency depreciation; the desire for economic self-sufficiency (autarchy); revenue considerations, especially in the case of duties on colonial products, such as tea and coffee; and, finally, retaliation against foreign tariffs or against dumping.

13. The methods adopted for protecting agriculture have undergone a considerable evolution during recent years. Before the war, and up to 1929, tariffs were the principal method used in restricting imports. In recent years, not only have tariffs been raised to record levels in most European importing countries, but they have also been supplemented by other and more drastic methods of restricting imports which insulate domestic price-levels more completely from the movement of world prices. Among the most important of these direct methods are quantitative restrictions on imports in the form of quotas or contingents. Rarely used before the depression, this type of restriction became increasingly important after the financial crisis of 1931. Its use was most general in the countries maintaining their currencies at the gold parity without exchange control, and quotas were applied to a wide range of foodstuffs in France, the Netherlands, Switzerland and Poland. Since the devaluation of the currencies of the first three countries, there has been some tendency to enlarge certain quotas and allow more foreign goods to be imported in order to prevent too rapid a rise in the cost of living; the quota system is, however, maintained.

14. Another method of restriction which has become quite common in parts of Europe in recent years is the licensing of imports, which is sometimes used in connection with the quota system and sometimes as an independent method of administrative protection. Under this method, a Government licence is required in order to import. In the United Kingdom, a licensing system is in force in connection with the meat quotas; in France, it is used in connection with the wheat quota and milling regulations; in Czechoslovakia,

the licensing of imports of wheat and rye is in the hands of the Grain Monopoly.

15. It is not necessary to describe here all the methods of agricultural protectionism, such as milling regulations, sanitary regulations and import monopolies. Special reference must, however, be made to exchange control. Originally imposed to control capital flight and prevent exchange depreciation, the official control of foreign-exchange transactions has become a protective device of great severity and effectiveness in certain European countries. Closely connected with exchange control is the system of clearing agreements; the tendency of these agreements is to equalise trade between the two countries concluding them, even at the cost of one country buying goods at relatively high prices. Though they are intended as an alleviation of exchange control, they may, therefore have the effect of raising food prices to the consumer of the food-importing country.

Effects of Agricultural Protectionism.

16. The effects of the restrictions on the international trade in food are of two kinds: first, on the volume of trade, prices and consumption and, second, on the volume and kind of production and the structure of domestic agricultural systems.

It can easily be shown that trade restrictions must normally increase consumers' prices under the conditions of supply and demand that usually prevail for foodstuffs—*i.e.*, conditions under which (1) an increase in price leads to a reduction of demand and (2) increased supplies are forthcoming only at higher prices.¹

¹ Fig. 1. — Domestic supply.

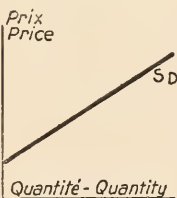


Fig. 2. — Foreign supply.

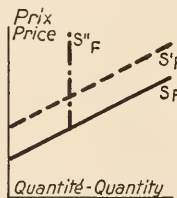
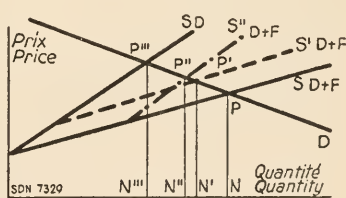


Fig. 3. — Demand and total supply.



D represents the demand curve of the importing country, S_D its domestic supply curve (Figure 1) for the commodity in question, and S_F the foreign supply curve

[Note continued on following page.]

It is not possible to demonstrate with scientific accuracy this obvious relation in concrete cases, because commercial policy is only one of several factors influencing prices. The relation does, moreover, not necessarily hold in all cases in the long run; it is possible that temporary protection may facilitate the development of more efficient home production and thus eventually reduce prices.

Table I.
RETAIL PRICES OF FOODS, IN SWISS FRANCS.

October 1936.

Countries (unweighted averages)	Wheat flour (kg.)	Beef		Pork		Bacon (kg.)	Milk, unskim- med (litre)	Fresh butter (kg.)	Fresh eggs (units)	Dried pea (kg.)
		First quality (kg.)	Second quality (kg.)	First quality (kg.)	Second quality (kg.)					
Argentina (Buenos Aires) .	0.28	0.98	0.86	0.97	0.88	0.95	0.17	1.70	0.05	1.75
Australia (2 towns) . . .	0.32	1.46	—	1.61	—	2.38	0.42	2.65	0.09	0.70
Austria (2 towns)	0.60	2.27	1.91	2.64	2.03	2.36	0.34	3.74	0.13	0.80
Belgium (Brussels)	—	3.67	1.59	2.93	1.80	1.80	0.22	3.05	0.13	0.50
Canada (6 towns)	0.39	1.81	1.17	2.13	1.98	2.95	0.42	2.78	0.12	—
Czechoslovakia (2 towns) .	0.43	2.21	1.74	2.21	1.78	2.45	0.24	2.69	0.11	0.60
Denmark (Copenhagen) . .	0.30	2.29	1.30	1.41	—	2.49	0.31	2.61 ^a	0.11	—
Estonia (2 towns)	0.33	0.86	0.59	1.04	0.96	1.12	0.14	1.89	0.05	0.33
France (5 towns)	0.64	3.88	1.53	3.01	3.09	1.93	0.30	3.31	0.17	0.67
Germany (5 towns)	0.82	—	2.88	—	2.89	3.89	0.40	5.40	0.21	1.22
Great Britain (6 towns) . .	0.37	2.50	1.27	2.73	2.—	2.97	0.53	3.31	0.16	0.45
Hungary (Budapest) . . .	0.23	1.99	1.64	1.42	1.28	1.64	0.22	2.26	0.08	0.43
Latvia (Riga)	0.42	—	0.53	—	1.01	1.29	0.14	1.79	0.09	0.38
Netherlands (4 towns) . .	0.47	2.47	2.19	2.12	1.49	1.65	0.23	3.89	0.12	0.51
New Zealand (3 towns) . .	0.32	1.36	1.13	1.53	1.53	2.37	0.32	2.30	0.09	—
Poland (3 towns)	0.41	—	1.14	—	1.16	1.30	0.17	2.47	0.08	0.29
Sweden (3 towns)	0.45	2.26	1.76	2.34	—	2.41	0.25	2.98 ^a	0.14	0.46
Switzerland (4 towns) . .	0.34	3.28	2.95	3.55	—	3.88	0.31	4.76	0.12	0.60
United States (8 towns) . .	0.47	2.73	2.01	3.48	2.88	4.01	0.56	3.91	0.15	0.87
Yugoslavia (5 towns) . .	0.29	1.22	0.92	1.52	1.22	1.46	0.25	2.75	0.10	1.—

^a Salted butter.

Continuation of note on preceding page.]

(Figure 2). In Figure 3, S_{D+F} is the total supply curve, formed by a horizontal addition of S_D and S_F , and shows the amount of both home and foreign production forthcoming at various prices. Under conditions of free trade, the price will be PN , and consumption ON , determined by the intersection of the national demand curve with the total supply curve. If a specific tariff is imposed, the foreign, and therefore also the total, supply curve will be shifted upwards to the left (*i.e.*, at any given price, a smaller amount will be brought on the market) to S'_F and S'_{D+F} respectively. Price is raised to $P'N'$ and consumption reduced to ON' . An *ad valorem* duty can similarly be shown to raise price and reduce consumption. In the case of a quota, the foreign supply curve becomes perpendicular S''_F , and the total supply curve S''_{D+F} runs parallel to the home supply. Price is raised to $P''N''$ and consumption reduced to ON'' . In the case of an absolute import prohibition, the total supply curve becomes identical with the home supply; price becomes $P'''N'''$, and consumption only ON''' . The effects of trade restrictions on a commodity of which there is no home supply is a special case of the above and can also be shown to involve price-raising and restriction of consumption.

17. In order to illustrate the extent of the differences in the retail prices of food in various countries, the table¹ above is given showing the prices of certain foods in twenty countries in October 1936.

It is, of course, not to be expected that retail prices would be identical in all countries. Even if there were complete freedom of trade, the cost of transport and retailing would result in differences. Moreover, there must be considerable differences in the quality of some of the foods represented in the above table. But these factors cannot account for the enormous international price discrepancies revealed in certain cases. These must be due in large measure to the restrictions which have been placed in the way of the international movements of food.

18. The following table compares, for the world as a whole, the changes in the quantum of food production and international trade in foods since 1929. The indices are computed by the Economic Intelligence Service of the League of Nations.

Table II.

WORLD PRODUCTION OF, AND TRADE IN, FOODSTUFFS.
(1929 = 100.)

Year	Production of primary foodstuffs	International trade in foodstuffs
1930	102	...
1931	100	...
1932	100	89
1933	102	83
1934	101	82
1935	101	85
1936	103	85

World production of primary foods remained consistently above the 1929 level in subsequent years, while the quantum of international trade in foods fell by as much as 15 % between 1929 and 1933 and showed little or no recovery thereafter. These divergent movements reflect considerable changes in the geographical distribution of food production. The protection given to domestic producers stimulated food production in Europe, while the loss

¹ The prices on which this table is based are published in national currencies in the *International Labour Review*, March 1937. They have been converted to Swiss francs at the average rates of exchange prevailing in October 1936. In the case of Germany, the official rate of exchange has been used; this has, of course, the effect of making the figures for that country relatively high.

of export markets resulted in some contraction of production in certain other parts of the world. The movements of primary food production and changes in the continental distribution are summarised below:

Table III.

WORLD PRODUCTION OF PRIMARY FOODSTUFFS, BY CONTINENTS.

	Production of primary foodstuffs (1925-1929 = 100)		Geographical distribution of production of primary foodstuffs (Per cent of world production)		
	1932	1935	1929	1932	1935
Europe, excluding U.S.S.R. . .	107	115	37.5	38.9	40.0
North America	100	90	21.0	20.9	18.8
Asia	105	101	15.6	16.0	15.4
Latin America	100	101	8.2	8.3	8.4
Oceania	130	133	2.6	3.2	3.3
Africa.	116	122	2.2	2.4	2.5

The main fact brought out in the above table is the steadily increasing importance of Europe as a centre of food production. The rise in European production is mainly due to the increased output in the industrial States which normally import a large part of their food requirements. The quantum of food imports into Germany, for example, was nearly 45 % less in 1935 than in 1929, and this decline was replaced—at least in part—by domestic production. Similarly, Italy imported over 40 % less food in 1934 than in 1929 and domestic production was greatly increased.

19. From the point of view of nutrition, the significance of this shift in the geographical distribution of food production lies in the fact that the industrial States of Europe are unable to produce food of the type formerly imported as cheaply as the exporting countries. The consumer is therefore forced to pay a higher price for food than would be the case if a larger proportion were drawn from abroad; and this higher price must inevitably tend to restrict the consumption either of the particular foods affected or of other foods.

20. In order to demonstrate that food prices have been kept at relatively high level in the countries which have restricted imports, it is not sufficient to concentrate attention merely on the absolute level of those prices, as they are influenced by other factors, such as currency policy and the general economic development, as well as commercial policy. It is preferable to study the relationship between food prices and other prices in order to show how the purchasing power of goods in general over food has changed. The

following table shows the yearly changes in the ratio of wholesale prices of food to wholesale prices of other commodities¹ in a number of countries—four of which export food and six of which are net importers. The relationship between the two series in 1929 is taken as 100, and when the figures given are less than 100, that means that food prices were relatively low—*i.e.*, that the purchasing power of other goods over food was greater than in 1929, and *vice versa*.

Table IV.

INDEX OF COST OF FOOD IN TERMS OF "OTHER COMMODITIES" AT WHOLESALE.^a
(1929 = 100.)^b

(1929 = 100.)										
Food-exporting countries										
Year			Canada	United States	Denmark	Australia				
1930	.	.	.	.	.	.	.	.	.	86 97 98 91
1931	.	.	.	.	.	.	.	.	.	77 94 89 69
1932	.	.	.	.	.	.	.	.	.	72 85 87 68
1933	.	.	.	.	.	.	.	.	.	76 80 87 66
1934	.	.	.	.	.	.	.	.	.	84 85 87 71
1935	.	.	.	.	.	.	.	.	.	86 100 91 74
1936	.	.	.	.	.	.	.	.	.	90 96 79
Food-importing countries										
Year			United Kingdom ^b	France	Germany	Italy	Czechoslovakia	Switzerland		
1930	.	.	.	.	.	.	.	.	.	100 105 103 109 111 115
1931	.	.	.	.	.	.	.	.	.	101 125 116 122 108 125
1932	.	.	.	.	.	.	.	.	.	103 146 123 143 106 118
1933	.	.	.	.	.	.	.	.	.	95 125 119 126 125 112
1934	.	.	.	.	.	.	.	.	.	94 109 122 123 116 106
1935	.	.	.	.	.	.	.	.	.	96 108 120 128 113 105
1936	.	.	.	.	.	.	.	.	.	96 124 119 118 133 113

^a Official price indices are used in each case.

For the United States, the United Kingdom, Italy, Czechoslovakia and Switzerland, group indices of food prices have been available; for the other countries (except France), sub-groups showing price movements of particular categories of foods have been combined, without weighting, into a general index. For France, an index of agricultural products was used. These various indices were then divided by indices taken to represent the prices of commodities other than food. For the United Kingdom, France and Italy, indices of prices of industrial goods were available and were used. For the other countries, the sub-groups of the wholesale-price index relating to commodities other than food were combined, without weighting, into a general index. The indices thus arrived at were divided into the indices of food prices, both being based on 1929 = 100. For Italy, the food and non-food indices refer to primary products.

^b For the United Kingdom, 1930 = 100.

On account of differences in the methods by which the various national indices are constructed, no attention should be paid to small differences in the figures in the above table. But the large differences between the "real cost" of food in the exporting countries and in those importing countries which have sharply restricted imports can undoubtedly be taken as reflecting the fact that, in the latter,

¹ See footnote "a" to the table.

food prices to the consumer have been kept at relatively high levels as a result of the protection afforded domestic producers.

21. In order to illustrate in greater detail the effect of trade restrictions on food prices, it will be sufficient to take three examples of somewhat different types of food: wheat (a food of high energy value), maize (important as fodder crop as well as human food) and butter (a food of high protective value).

22. Of all the foods entering international trade, wheat has been the most subject to Governmental interference and control in recent years. Tariffs have been raised, import quotas and licensing systems imposed and domestic production directly subsidised in most European States. Thus, in France, the duty on wheat was raised from 35 to 83.20 francs per 100 kg. between the beginning of 1929 and the beginning of 1936; wheat can only be imported under licence, and millers must mix certain proportions of domestic with foreign grains. In Italy, the duty on wheat was raised from 40 to 75 lire per 100 kg. in the same period; milling regulations have been in force since 1931, and wheat can be imported only under licence. In Czechoslovakia, import duties were raised; a Grain Monopoly was established with power to license imports; milling regulations were imposed. In 1934 and subsequent years, an import duty of 2s. per quarter was imposed on foreign imports into the United Kingdom.

The following table shows the changes which have taken place in world trade in wheat and flour in recent years:

Table V.
WORLD TRADE IN WHEAT AND FLOUR, IN THOUSANDS
OF METRIC TONS. ^a

	Net exports			Net imports	
	1926/27- 930/31	1934/35		1926/27- 1930/31	1934/35
Argentina	4,450	4,930	U.K. and Irish Free		
Canada	7,990	4,470	State	6,260	5,900
Australia	2,660	2,910	Italy	2,100	330
U.S.A.	4,170	— ^b	Germany	1,830	275
European exporters.	1,150	1,270	France	1,275	— ^c
U.S.S.R.	890	50	Other European		
Others	400	990	countries	5,200	3,670
World total . .	21,710	14,620	European total	16,670	10,180

^a From International Institute of Agriculture: "World Agricultural Situation in 1934/35" (Rome, 1936).

^b Net import of 180,000 metric tons.

^c Net export of 460,000 metric tons.

The above table shows that the restriction of imports has been particularly severe in Italy, Germany and France. Together, these three countries account for about 70% of the decline in world net exports between the two periods shown.

The effect, indeed the object, of Governmental intervention in the wheat trade is to ensure that the domestic producer obtains a higher price than that prevailing on world markets. The following table shows the recent changes in the price of wheat in four countries which normally export wheat and six countries which normally import it:

Table VI.

WHOLESALE PRICE OF WHEAT IN CENTS (GOLD PARITY)
PER BUSHEL OF 60 LB. (27.216 KG.)

January		Argentina	Exporting countries		United States of America
			Canada	Hungary	
1929		115.40	120.37	117.59	120.63
1930		123.63	129.51	115.49	122.00
1931		51.99	53.62	66.17	79.25
1932		43.64	51.26	63.31	57.51
1933		39.28	38.86	53.10	48.26
1934		33.03	38.18	27.78	55.67
1935		33.72	47.37	52.31	63.50
1936		54.99	50.00	52.47	68.93
1937		59.32	72.97	67.45	80.84

January		United Kingdom (Manitoba)	Italy	Importing countries		Switzerland ^a
				France	Germany	
1929		150.57	193.21	164.64	135.55	221.73 ^b
1930		152.62	194.79	146.05	159.50	221.55 ^b
1931		75.10	149.41	184.55	167.48	209.79 ^b
1932		66.96	150.00	178.51	147.47	201.75
1933		52.83	155.66	115.85	119.85	194.18
1934		51.73	123.31	132.71	120.63	189.38
1935		56.35	130.24	82.87	131.66	177.94
1936		62.23	145.90	90.17	132.45	178.73
1937		90.05	104.86	111.04	134.49	125.35

^a Price paid to the producer.

^b Yearly average.

The effect of high wheat prices in stimulating production in the protected markets is referred to below. Their effect on the quantity of bread consumed is probably not very great, but, on the other hand, the impact of high bread prices on general nutritional

levels must be considerable. The poorer sections of the working population of modern industrial communities may spend as much as 20% of their total food expenditure on bread or bread products. When the price of bread goes up, or when it is maintained at a relatively high level at a period when money incomes are falling, more of their income must be spent for this necessity of life and less is available for other foods. In these circumstances, their purchases of supplementary foods are likely to be restricted. In short, the demand for bread is inelastic, and a relative increase in its price is equivalent to a reduction in real income. The following chapter shows in detail how a reduction in income results in a decline in the consumption of the protective foods and deterioration of the diet. These effects of high wheat prices on bread-consumers must be weighed against their influence on the incomes and consumption of wheat-producers.

23. Since 1933, with the growth and spread of the desire for economic self-sufficiency, restrictions have been placed, not only on international movements of cereals for human consumption, but also on trade in fodder crops. In France, to take but one example, imports of maize amounted to 9.6 million quintals in 1932; a quota of 3.7 million quintals was imposed in 1933, and by 1935 this had been reduced to 2.1 millions. For oats, the 1935 quota was 25,000 quintals compared with imports of 1.2 millions in 1932; for barley, 195,000 compared with imports of 2.3 million quintals in 1932. Some of the principal changes in the world trade in maize are summarised below:

Table VII.

WORLD TRADE IN MAIZE, IN THOUSANDS OF METRIC TONS. ^a

	Net exports				Net imports		
	1926-1930	1931-1933	1934		1926-1930	1931-1933	1934
Argentina . . .	5,870	7,280	5,470	<i>Producing coun-</i>			
Danubian coun-				<i>tries</i>	2,800	2,970	1,950
tries ^b	1,440	1,830	1,360	Italy	660	510	160
United States. .	520	130	80	France	740	980	630
World total . .	9,010	10,490	8,470	Czechoslovakia. .	300	390	210
				<i>Non-producing</i>			
				<i>countries</i>	5,750	7,150	6,030
				United Kingdom	1,790	2,660	3,120
				Netherlands . .	1,150	1,500	1,000
				Germany	1,080	510	390

^a International Institute of Agriculture, *loc. cit.*

^b Roumania, Yugoslavia, Bulgaria and Hungary.

Where imports have been restricted, the domestic price has, of course, risen above world levels. The nutritional significance of artificially high prices for fodder crops lies in the fact that these are a raw material of the animal husbandry industry; and when fodder prices are raised, this naturally tends to raise the price of milk, butter, meat and other valuable human foods. It is perhaps worth raising the question whether the protection of domestic production of cereals for human consumption could not by some means be prevented from increasing the cost of producing foods particularly valuable from the standpoint of nutrition.

24. Since 1930, the trade in butter in most countries has been severely curtailed through high import duties and quantitative restrictions. The German import duty on butter, which was RM 27.50 per 100 kg. before November 1930, was increased by stages to RM 75 per 100 kg.; the State exercises a monopoly of dairy marketing and there is a monopoly tax almost as high as the duty. Import quotas on butter are fixed from month to month. In France, the minimum duty on butter in the last quarter of 1936 was 728 francs per 100 kg.; quota restrictions have been in force since 1931 and there is a licence tax of 200 francs per 100 kg. Imports of butter into Belgium have been restricted by quota since 1932 (except for the period October 1935-March 1936); the duty is 161 francs per 100 kg. and the licence tax 750 francs per 100 kg. The general duty on imports of butter into Italy is 500 lire per 100 kg. In Switzerland, there is an import duty of 20-30 francs per 100 kg. *plus* a supplementary duty of 100 francs. A system of quotas has been in force since 1931 and there is an import monopoly.

Recent changes in the trade in butter are shown below:

Table VIII.

WORLD TRADE IN BUTTER, IN THOUSANDS OF METRIC TONS. ^a

	Net exports			Net imports	
	1926-1930	1934		1926-1930	1934
Denmark	150	150	United Kingdom .	305	485
New Zealand	75	130	Germany	120	60
Australia	40	110	Switzerland	8	0.3
Netherlands	45	35	Europe	439	563
Sweden	20	25			
World	475	590			

^a International Institute of Agriculture, *loc. cit.*

In spite of increased restrictions, the world trade in butter was higher in 1934 than in 1926-1930; but this was entirely due to greatly increased imports into the United Kingdom, where the sharp fall in butter prices led to a striking increase in consumption. Imports into Germany fell by half, and were also sharply reduced in most of the minor importing countries. Many butter-exporting States subsidised exports in this period by taxing the domestic consumer of butter or liquid milk. In this way, the price to the consumer was kept relatively high in certain of the exporting as well as in most of the importing States.

Table IX.

RETAIL PRICE OF BUTTER, OCTOBER 1936.
(In Swiss francs per kg.)

Exporting countries		Importing countries	
Estonia	1.89	Czechoslovakia	2.69
New Zealand	2.30	Belgium	3.05
Denmark ^a	2.61	United Kingdom	3.31
Australia	2.65	France	3.31
Sweden ^a	2.98	Switzerland	4.76
Netherlands	3.89	Germany	5.40

^a Salter butter.

It has been shown earlier, in Part III, Chapter 3 above, that the demand for butter is elastic and that consumption has increased markedly in countries where the price has been relatively low. The new science of nutrition attaches special importance to the consumption of milk and dairy products, and it is clear that the policy of heavy import duties in the importing countries and export bounties collected by a tax on domestic consumption in the exporting countries militates against the desired increase in consumption; the consumer pays at both ends. The question may be raised whether the sums spent in subsidising exports from certain countries could not, with greater profit—at least from the standpoint of nutrition—be spent in subsidising the domestic consumption of liquid milk and/or butter.

25. The effects of agricultural protection on agriculture itself are naturally different in the exporting and the importing countries. The restriction of the world market tends to depress the price and income which the producer in the exporting country obtains for his

product, and so to have a deleterious effect on his standard of nutrition. The consumer in the exporting country will (if there is no Government intervention designed to keep domestic prices above world levels) be able to obtain certain foods cheaper than would be the case if more of the total production could be sold abroad; and this fact will, other things being equal, tend to increase his consumption in cases where the demand is elastic. The recent increase in the consumption of butter in Denmark may be quoted as an example of this type of reaction. As already observed, however, certain exporting countries have taxed the domestic butter consumer in order to subsidise butter exports. The following table ¹ shows the differences in March 1935 in the wholesale price of butter for domestic consumption in certain exporting countries and the price at which butter from the same countries was quoted on the London Provision Exchange:

Table X.

WHOLESALE PRICE OF BUTTER IN CERTAIN HOME MARKETS AND IN LONDON,
MARCH 1935.

(In Swiss francs per 100 kg.)

Country of origin	Average monthly quotation in home market	Average monthly quotation of London Provision Exchange for butter from country indicated
Argentina	80 ^a	107
Australia	160	105
Denmark	74	146
Netherlands	298	112

^a April.

The table makes it clear that the domestic consumer of butter in certain exporting countries has to some extent been subsidising consumption in the United Kingdom.

The demand for cereals, on the other hand, appears to be inelastic; and the sharp fall in domestic prices in certain export markets which took place in recent years—and which was partly cause and partly effect of the trade restrictions—led to no increase in the domestic consumption of cereals as a whole, so that there

¹ From C. M. WRIGHT: "Butter as a World Staple" in *Index* (Stockholm), November 1935.

was no direct nutritional gain to set off against the farmer's loss. Moreover, the income of the non-farming food-purchasing section of the community in countries exporting food is partly dependent on the ability to sell industrial goods to the domestic farming population; and the contraction of farm income which results from trade restrictions necessarily tends to reduce also the income of other sections of the population, and so to affect adversely their level of nutrition.

26. The effects of commercial policy on the quality of the nutrition of the protected agricultural population of food-importing countries are not easily determined. It has been shown above that the effect of trade restrictions is to keep food prices in the protected markets at relatively high levels, and it has been argued that this tends to limit the purchases of food-purchasers in these countries. Conversely, the high domestic prices mean that the income of the domestic farmers who sell the protected foods tends to be higher than would be the case if more foreign supplies were allowed in, and if they continued to produce these same products.

If, however, protection and high prices lead to so great an increase of domestic production that all domestic requirements are covered and there is a surplus available for export, the control of the domestic price will be endangered. The rapid fall in the price of wheat in France when an export surplus was produced in 1933 provides a good illustration of this danger. It is, of course, clear that the high domestic price increases the income of producers in the domestic market only in so far as they are producing for sale. Where production of the protected crops is on a subsistence basis, price is of much less importance, and certain types of agricultural protection may even tend to reduce the income of some sections of the agricultural commodity. For example, in many European States which have imposed severe restrictions on imports of grain crops, grain is sold chiefly by the farmers with relatively large estates. The small farmer generally produces grain only for his own requirements and sells chiefly animal crops. For him, the protection of grain crops may mean higher fodder prices—*i.e.*, higher raw-material costs.

It is therefore necessary, in considering the effects of particular trade restrictions on agricultural income and prosperity in the protected markets, to distinguish sharply between the interests of

the various sections of the agricultural population, which may at times be quite divergent. Moreover, it is also necessary to take into account the effect of these policies on the general level of economic prosperity, on which the fortunes of domestic agricultural systems are everywhere closely dependent. The maintenance of food prices at relatively high levels in industrial countries may have an injurious effect on the export trade by keeping labour costs high and reducing competitive capacity in international markets. Furthermore, the growth of industrial protection in the food-exporting States is the inevitable counterpart to the growth of agricultural protection in the food-importing States.

27. Through their influence on relative prices, tariffs and other trade restrictions make certain types of agricultural production more profitable than others, and producers consequently tend to concentrate, so far as natural conditions permit, on the more profitable lines. In this way, there is a tendency for unsuitable land to be brought under cultivation and for average yields to be reduced. An illustration is afforded by the recent history of wheat production in Europe. Figures have been quoted in Table VI above to show that since 1929 the tariffs imposed on wheat have kept its price relatively high in certain European markets. The extent to which producers have reacted to this situation is illustrated in the following table, showing the changes in the acreage under wheat in different parts of the world:

Table XI.

AREA HARVESTED TO WHEAT, IN MILLIONS OF HECTARES. ^a

	Average 1926-1930	1931	1932	1933	1934
Four great exporting countries ^b .	47.8	46.2	47.7	43.2	38.8
European importing countries . . .	19.6	20.3	20.9	21.6	21.6

^a From International Institute of Agriculture: "The World Agricultural Situation in 1934/35" (Rome, 1936), page 54.

^b Argentine, Australia, Canada and United States.

While the great exporting countries, where wheat is produced by mechanised low-cost methods, reduced their acreage by 9 million hectares, or nearly 20%, between 1926-1930 and 1934, the European importing countries increased theirs by 2 million hectares, or 10%. The significance of this shift in production from the standpoint

of nutrition has already been indicated. The increase in the area under wheat in the importing countries of Europe is also significant from the point of view of the adjustment of agriculture to the trends in consumption outlined in earlier chapters. As wheat prices have been kept relatively high, the economic inducement to go over to other cultures has been lessened, and this despite the fact that the trend of wheat consumption is down and the trend of consumption of certain other foods upwards. It is, of course, impossible to say what the structure of European agricultural systems would be if the protection given them were less or of a different character. Protection has been given, not only to the producers of cereals, but also, for example, to butter and meat producers. Domestic *production* of these latter foods has been stimulated, though possibly to the detriment of domestic consumption.

28. What, then, is the rôle of commercial policy in connection with nutrition? From the preceding analysis, it appears that any quota tariff, tax or trade restriction whose effect is to raise the price which the consumer must pay for *any* food (or even non-food) is likely to have an adverse effect on his nutritional standards. If the price of cereals (or other foods of high energy value) is raised, or kept high when incomes are falling, the consumption of cereals (or the other foods of high energy value) is not likely to be much affected, as the first desire of the consumer is to satisfy his hunger; and, even though bread prices are kept high, bread generally still remains the cheapest means of doing this. The consumer does not eat less bread, but he pays more for what he eats. This is equivalent to a reduction in his real income; and, as he is forced to curtail his expenditure on other foods, the consumer will (as is shown in detail in the next chapter) restrict his purchases of the higher-priced protective foods which are essential for health and efficiency.

If, on the other hand, commercial policy results in relatively high prices of the protective foods, the adverse effect on the amounts consumed is even more direct. In the first place, as in the case of cereals, the high prices mean a reduction in real income which is likely to be followed by a general redistribution of food expenditure in a way inimical to sound nutrition. Moreover, the demand for many of the protective foods has been shown to be elastic—*i.e.*, to change rapidly in proportion to changes in price. A rise in their price is likely, therefore, to result in a direct restriction

in their consumption and the substitution of cheaper and less nutritious foods. It has, for example, frequently been observed that, when the price of butter rises relatively to that of margarine, the consumption of butter falls and that of margarine increases.

29. The considerations of the preceding paragraph are confined to the influence of trade restrictions on the level of nutrition of the food-purchasing public. Important though these considerations are, they are not the only ones determining agricultural policy. Nor is it urged here that these considerations should necessarily be decisive in any concrete case: to give them sole weight would be to neglect the interests of food-producers and result in a radical transformation in the economic structure of certain States which, for social, political and military reasons, could not be undertaken. It is essential to balance the interest of the farmer, who is at once producer and consumer of foodstuffs, against those of other workers, who are consumers only. Moreover, liberty of international commercial transactions is necessarily bound up with the international mobility of capital and labour; it would seem clear that no considerable increase in the international movement of commodities can be expected without a corresponding increase in the international movement of the factors which produce them.

It cannot, however, be too strongly urged that, in framing their commercial and general economic policy, Governments should give due weight to these considerations of a nutritional order. If they have not always done so in the past, this is at least partly due to the fact that the importance of adequate nutrition as a factor influencing health and efficiency has not been fully realised. With the knowledge which has been gained in recent decades, it is now apparent that irreparable harm can be done through faulty diet; and it is to be hoped that this knowledge will influence Governments more than hitherto when they are contemplating measures whose effect will be to raise food prices to the consumer and so restrict his consumption. It is pleasant to be able to record that the knowledge of the importance of adequate nutrition has recently influenced the commercial policy of at least one country: in February 1937, the Estonian import duties on fruit were very substantially reduced. In introducing this measure, the Estonian Minister of Commerce explained that its purpose was to increase the consumption of fruit and so improve the nutrition of the Estonian people.

30. If considerations of nutrition are kept in mind, it may be possible to devise means which will assist national agricultural systems without exerting an adverse effect on consumption levels. The appropriate means will depend upon the circumstances of each particular case, and it is not possible to give concrete indications here. From the standpoint of nutrition, it would seem that measures for the expansion of consumption are preferable to measures which restrict imports or production. Through such measures (which may, in certain cases, involve subsidies to consumption collected through the general taxing power of the State) it may be found possible to encourage both the production and the consumption of protective foods. The structure of national agricultural systems may, through these means, be encouraged to develop along the lines on which consumption should change—with benefit both to producers and to consumers. Particular attention may be drawn to the possibility of the cheap or free distribution of certain foods to certain sections of the community—such, for example, as the distribution of milk to school children and expectant and nursing mothers. The possibilities with regard to milk are particularly important, as this is a food of unique nutritional value and one which cannot, in its nature, enter into international trade to any great extent. Here the interests of nutrition and national agricultural systems clearly coincide, and it would seem that greater use might be made of this fact by many countries in framing their agricultural policies. What is true of milk holds in only slightly less degree of certain other commodities, such as fresh fruit and vegetables. The methods of subsidising consumption present greater difficulties in these cases, but examples have been quoted above to show that, in certain cases, successful techniques have been devised. It is obviously impossible to make specific recommendations here; it is sufficient to express the opinion that the problem of devising methods which will assist domestic agricultural systems without harming nutritional levels is worthy of the most earnest consideration on the part of Governments.

D. PRICE AND PRODUCTION CONTROL.

31. Commercial policy is not the only instrument which has been used deliberately to control the supply and prices of foodstuffs.

Intervention by the State or by voluntary organisations of producers has been directed in several cases towards a deliberate restriction of production with a view to raising prices. In other cases, production has been stimulated by subsidies or other means in an attempt to increase self-sufficiency in foodstuffs. Finally, State intervention in regard to food prices has sometimes been undertaken to protect consumers against a rise in prices resulting from devaluation, or from scarcity due either to natural or to artificial causes.

32. Measures directed towards raising food prices by restriction of production have been undertaken mainly by exporting countries which have lost a considerable part of their export markets. Intervention in such cases is designed to assist the process normally brought about, after the lapse of time, by the forces of the market. These forces, which tend in other sections of the economy to eliminate unprofitable enterprises through the price and profit mechanism, are notoriously slow and ineffective in the sphere of agriculture. Farmers may continue to produce at a loss for many years, and even, in some cases, meet falling prices by an increase in output in the attempt to maintain gross receipts. The result is a further fall in prices, particularly where the normal outlets are artificially cut off by trade restrictions. In such cases, State action has been taken to bring about a reduction in output, in the hope that prices may be raised once more to remunerative levels.

An outstanding example of such measures was the agricultural adjustment programme introduced in the United States in 1933. Benefit payments and compensation were paid to producers who undertook to reduce the acreage of wheat and corn planted and the production of hogs; in addition, an emergency programme of purchasing sows and pigs for slaughter removed considerable supplies from the market. These measures, aided by a severe drought, led to a certain rise in prices. Following the rise in world prices and a succession of dry seasons, the measures introduced in 1936 after the Agricultural Adjustment Act had been declared unconstitutional laid more emphasis on diversification and balancing of production with a view to soil conservation than on restriction.

An extensive programme of production restriction was applied also in the Netherlands to meet the difficulties of marketing

agricultural commodities at remunerative prices, both abroad and in the home market. Thus, the area sown to wheat on any given farm was restricted to one-third of its arable land. Potato production was limited by the imposition of a fee of 30 florins per hectare for permission to cultivate. Cattle and hog production was reduced by the limitation of the number of calves and hogs allowed per farm, as well as by the purchasing of inferior cows and of hogs for slaughter and distribution to the unemployed. The hatching of eggs was allowed only by those with incubation permits. Production of vegetables and small fruits was compulsorily reduced by percentages varying from 10 to 75 according to the areas cultivated. Cheese production was, moreover, reduced by a voluntary agreement.

In Denmark, also, meat prices were raised by the buying-up and slaughtering of surplus cattle, and steps were taken to assist the reduction of pig production after the limitation of the British market through quotas.

These examples are sufficient to illustrate the type of State intervention which has been applied by exporting countries to the problem of agricultural surpluses arising mainly from the loss of export markets.

33. The measures of production control employed to improve the situation of farmers in importing countries serve a somewhat different purpose. They are generally employed in combination with import restrictions for the purpose of creating a relative scarcity in the domestic market: the control of prices due to tariff or quota regulations may become ineffective if it encourages too great a compensatory expansion of domestic production.

Some measures of output control in the United Kingdom may be classed under this head. The marketing scheme designed to increase the profitability of potato and hop production are based on the limitation of supply: in the case of potatoes, by fines on increased acreage and, in the case of hops, by prohibiting any increase beyond strict quotas, reinforced by the limitation of imports. For wheat, the full assistance secured under the Wheat Act (1932) has, up till 1937, been paid only on a limited output (27,000,000 cwt.). The milk and hog marketing schemes, on the other hand, have led to a considerable increase in production; in the case of milk, this has meant mainly an increase of milk sold

for manufacturing purposes, assisted by heavy subsidies and voluntary agreements limiting the imports of processed milks.

The policy in regard to wheat prices in France arose from a situation half-way between the two above considered. French wheat production normally covered about 75% of domestic requirements. A bumper crop in 1932/33 led to a surplus which threatened to produce a violent fall in prices. This was not considered as a permanent problem requiring acreage reduction, but an emergency calling for an immediate control of existing supplies. Two types of measures were applied: the purchase of wheat for purposes of denaturing¹ and export, and the development of storage facilities and a carry-over system, with a guaranteed minimum price. The latter method has been maintained as a means of evening out undue price fluctuations.

34. A further type of price control which has been applied for the benefit of farmers in some of the wheat-exporting countries in Eastern Europe is that of a monopoly organisation employing discriminating prices in the home market and for export. Thus, the Central Grain Purchasing Bureau in Bulgaria buys and sells grain in the domestic market at high fixed prices and exports at world parity prices. A similar policy is carried out by the Privileged Export Company in Yugoslavia.

35. Another measure employed for the benefit of wheat farmers in a number of countries is the compulsion of domestic millers to employ a given proportion of domestically produced wheat, thus increasing its market and normally tending to raise the price of bread.

36. In the later stages of the production of foodstuffs, price-raising measures are more frequently the result of voluntary monopolistic organisations of processors or retailers for the purpose of fixing minimum prices. The attitude of the State towards such policies is generally less sympathetic than in the case of the primary producers; this is partly due to the fact that agricultural production is being encouraged in many countries as part of a national policy of self-sufficiency or for other social or economic reasons, and partly

¹ *I.e.*, rendering unfit for human consumption.

because the conditions of processing and retailing are more mobile and susceptible to the working of market forces, and therefore require less State assistance, than in the case of primary production. In some countries, however, an attempt has been made to improve the situation of retailers by a limitation of their number through licensing systems.

37. Finally, mention must be made of intervention applied to the price system for the benefit of consumers. Such intervention has, on the whole, been less frequent than measures designed to raise prices to the producer. Recent examples are, however, afforded by the steps taken in certain countries—for example, Belgium, Czechoslovakia and France—to prevent currency devaluation from resulting in speculation in food and an unwarranted rise in the cost of living.

Germany probably offers at present the most extreme example of food-price regulation outside the Soviet system. Prices are there fixed both with a view to encouraging production by improving the returns to producers and, at the same time, for the purpose of protecting consumers from the effects of the relative scarcity resulting from increased monetary demand and the drastic exclusion of imports. Thus minimum prices are established for the sake of producers and maximum prices combined in some cases with rationing, both for the benefit of consumers and as a means of directing consumers' choices in accordance with the general economic programme. The result has been a severe cutting-down of margins earned by intermediaries between the primary producer and the ultimate consumer.

38. The above examples serve to indicate the high degree to which prices may be affected by State intervention or by monopolistic organisation of the market. It would be out of place to enter here into the merits and demerits of such interventions in particular cases. It is important, however, to emphasise, from the point of view of nutrition policy, that a powerful weapon for the influencing of nutrition standards lies at the disposal of Governments in the form of price and production control, and that, whenever this weapon is called into action for one purpose or another, the interests of nutrition should be given particular weight.

E. DISTRIBUTION COSTS.

39. The last link in the chain leading from producer to consumer is the distribution stage. The costs of distribution are periodically—particularly during the depression phase of the business cycle—subject to attacks from the side both of consumers and of producers. The producer calls for a reduction in distributors' margins as a means of raising the price obtained for his produce, while the consumer hopes thereby to reduce the prices which he has to pay at retail.

40. In recent decades, there has been a notable increase in most countries in the proportion of the population engaged in distribution. This is no doubt to be explained largely by the extension of the services supplied by distribution—more rapid and frequent delivery, improved packing, etc.; it may be due in part, however, to the fact that the recent striking rise in productivity per head which has characterised most branches of production has not been accompanied by a corresponding movement in all branches of distribution.

41. Interesting data comparing the changes in efficiency of production and distribution in German consumers' co-operative societies are given by the Central Union of Consumers' Co-operative Societies.¹

Table XII.

VALUE OF SALES PER PERSON ENGAGED IN DISTRIBUTION
OR PRODUCTION.

Year	Distribution RM.	Production RM.
1903	23,778	14,121
1904	22,771	12,277
1909	23,761	16,055
1914	19,427	23,027
1925	19,849	25,607
1926	22,660	28,390
1927	24,403	30,987
1928	25,285	36,199
1929	26,812	37,836
1930	28,143	41,340
1931	28,572	40,182

¹ *Year-Book*, 1932.

42. The United States Department of Agriculture has recently published figures ¹ showing the estimated retail value and equivalent farm value of quantities of fifty-eight foods purchased annually by a typical American working-man's family:

Table XIII.

FARM AND RETAIL VALUE OF TYPICAL FOOD SELECTION IN U.S.A.

Year	Farm value \$	Retail value \$	Margin \$	% of farm value	United States earnings per hour of wage-earners (1926 = 100)
1913	134	252	118	88	44
1920	272	514	242	89	102
1922	170	374	204	120	91
1929	195	415	220	113	102
1932	88	270	182	207	81
1936	150	345	195	130	91

43. Various enquiries, official and unofficial, have been made into the costs of distribution generally with a view to determining whether these costs are excessive.

The National Economic Council in France reported in 1933 on the distribution of foodstuffs in the following terms:

" 1. Our internal prices are high: the considerable fall in the costs of production during the years 1931 and 1932 was not followed in every case by a corresponding fall in wholesale prices, nor, in particular, in retail prices.

" 2. For certain commodities, the selling-price has been burdened by costs disproportionate to the value of the product; the excessive number of middlemen and distributors reduces the profits for each one, and obliges them to distribute their costs over too small a volume of sales.

" 3. The margin of profit gained by the middlemen varies considerably from one product to another. The National Economic Council was unable to find reasons to justify these substantial differences in percentages.

" The National Economic Council was unanimous in recognising the inadequacy of the organisation of the distribution of foodstuffs." ²

The Linlithgow Committee, which reported in 1923 on the marketing of milk, fruit, vegetables, meat, poultry and eggs in the United Kingdom, concluded that the cost of distribution of

¹ See U.S. Department of Agriculture, Bureau of Agricultural Economics: "Looking Ahead on Agricultural Policy" (Washington, December 1936).

² Conseil National Economique: "La Répartition des Denrées alimentaires". (Paris, 1933.)

these commodities was too high. "Taken as a whole, distributive costs are a far heavier burden than society will permanently consent to bear". The Geddes Committee, which reported in 1925, found that margins had been reduced and that the average profits were not excessive in the meat trade, though somewhat high in the retail baking industry.¹

44. Both the absolute and relative costs of distribution have shown everywhere a marked increase; caution must, however, be exercised in drawing conclusions regarding the scope for reducing distribution costs from a study of the nominal margins between producers' and consumers' prices. In the first place, the increase in distribution costs can be explained to a considerable extent by the extension of the services expected of and provided by distributors. Consumers have become more particular; the standards of quality and service demanded from distributors have been raised. The conditions of production and distribution of foodstuffs are expected to reach a higher level of cleanliness, and human handling of foods has to be reduced to a minimum; the premises where food is retailed to the public have become more hygienic, and at the same time more elegant and luxurious. The goods are frequently delivered standardised and packed, so that the consumer can be sure that he is obtaining food of a uniform quality and weight. In the case of many staple foodstuffs—bread, milk, meat, etc.—he is no longer content to fetch them from the market or retail store, but expects them to be delivered to his door, once or even twice a day. All these improved services necessarily involve increased costs.

Although many of these developments have been of undoubted benefit to the consumer, there has, at the same time, been an unfortunate tendency in some countries for the over-development of standardisation and elaborate packing to deprive poorer people of access to plain but wholesome products. The demand on the part of many consumers for cheaper goods with less distributive services has led to the extensive development in some of these countries of cash-and-carry food stores.

45. In a recent study² of the costs of milk distribution in

¹ First Report of the Royal Commission on Food Prices, Vol. I, 1925.

² R. B. FORRESTER: "Milk Price Margins". Empire Marketing Board, 51. (London, 1932.)

several cities, the author found that the size of the margin was clearly related to the quality of the product and the service provided. The absolute margins between prices received by producer and paid by consumer are shown below:

Table XIV.
MILK MARGINS IN VARIOUS CITIES.
(In pence per imperial gallon.)

London	11 ² / ₃ -11 ³ / ₄
Glasgow.	9 ¹ / ₆ -10 ⁵ / ₆
Berlin.	6 ¹ / ₄
Hamburg	6
Copenhagen	9-10
Paris and suburbs	5- 5 ¹ / ₂
New York.	18 ¹ / ₂
Chicago	19

The high margins in New York and Chicago were found to correspond to high-quality hygienic and delivery services, 3.5% normal butter-fat content, compulsory pasteurisation and universal free delivery in bottle containers. The next group—London, Glasgow and Copenhagen—was stated to provide the best standards of hygiene and delivery among the European cities represented. The low margins in Berlin, Hamburg and Paris were stated to correspond to a lower degree of hygienic preparation, lower butter-fat content and delivery in bottle containers only on payment of an extra charge. The above rough correlation between quality and cost is not intended to suggest that economies in the distributive processes cannot be achieved; it is merely intended as a warning against the use of absolute margins as an index of the scope for such economies.

46. In a study on the distribution of certain fruits in France, the author remarks: "The margin which surprises the uninitiated causes much less astonishment to anyone who considers the numerous processes to which the product is subjected. Economic functions are not imposed by the will of men, but by the nature of things; and every stage of preparation inevitably involves costs."¹

¹ André BÉRARD: "Du Producteur au Consommateur".

47. Not only are the so-called margins frequently to be regarded rather as payments for special services, but, in addition, it must be remembered that the size of the margin is necessarily dependent on the rate of turnover and the value of the product. Many of the costs of distribution are fixed, and, if sales shrink rapidly as during a depression, these costs have to be spread over a smaller volume of sales, so that the unit burden is necessarily increased.

48. The following table shows the movements of farm prices and margins on retailing, processing, wholesaling and live-stock marketing of all meats in the United States in the years 1925, 1930 and 1934:

Table XV.

VALUES AND MARGINS OF ALL MEATS IN THE UNITED STATES. ^a

	1925		1930		1934	
	Cents	%	Cents	%	Cents	%
Value at retail.	24.6	100	23.7	100	17.2	100
Margin for retailing	5.2	22	5.6	24	5.2	30
Value at wholesale	19.4	78	18.1	76	12.0	70
Margin for wholesaling	1.1	4	1.0	4	1.0	6
Value at plant.	18.3	74	17.1	72	11.0	64
Margin for processing	3.7	15	3.7	15	3.94	23 ^b
Market value of live-stock	14.6	59	13.4	57	7.1	41
Margin for live-stock marketing	1.0	4	0.9	4	0.9	5
Farm value of live-stock	13.6	55	12.5	53	6.2	36

^a Bernard TOBIN: "What becomes of the Consumers' Meat Dollar?" Chicago, 1936.

^b Includes processing tax 1.4 cents = 8½% of retail value.

Even before the rapid fall in the price of live-stock, the farmer received only slightly more than half of the consumer's meat dollar. During the economic depression, when the farm value of live-stock fell violently, the various margins also fell absolutely but very much less rapidly, so that their share in the consumer's meat dollar was much increased.

49. The organisation of distribution varies so widely from country to country and from industry to industry that it would not be possible to make statements or recommendations in regard to distribution costs which could lay claim to general validity. The number of middlemen required to accomplish the transfer of products from the primary producer to the ultimate consumer

varies with the size and density of the population, with the nature of processing and the retailing and delivery services provided, with available transport facilities and with other locally differentiated factors. Moreover, credit facilities and such systems as that of retailing by mail order are developed to very different degrees in different countries. For reasons of this kind, it is possible here only to indicate in quite general terms the directions along which improvements in the organisation of distribution appear to have taken place and to be still possible in a number of countries.

In general, certain stages of distribution appear to offer considerable scope for economies of large scale. The saving on transport and handling costs resulting from centralisation of distribution over large areas, even if not over whole national markets, can be seen in the relative economy and success of co-operative and State schemes for the marketing and distribution of agricultural products and foodstuffs. Economies have been effected in this way also in the holding of stocks at various stages, in the elimination of wasteful competitive advertising, in rents for warehouses, processing plants and retail premises, and in costs of collection and delivery.

The contribution of producers' and consumers' co-operative organisations to nutrition policy through the reduction of marketing and distribution costs, and the consequent increase of farmers' and consumers' purchasing power, has been described in the report on "Workers' Nutrition and Social Policy" of the International Labour Office.¹

"In one form or another, the object is always to increase the consuming capacity of the members.

"This result is achieved by the co-operative organisations in two different ways: they either try to reduce the cost of the economic services they render to a minimum, or they make the price demanded for these services coincide as closely as possible with their actual cost free from all superfluous charges.

"To reduce the cost of their services, the federal structure of the organisations enables them and the small economic units of which they are composed to benefit by financial, administrative and technical concentration in the same way as any large undertaking. In addition, they can make use of other methods that are special to the co-operative movement.

"The most usual, and in any case the most obvious, means by which the price charged for the services rendered is made to coincide with the actual cost is the

¹ *Op. cit.*, Chapter VII, Section 4.

refund of 'surpluses' in whatever form this may take. This method, in effect, confers additional purchasing power on the members of the distributive societies. . .

" The savings effected by the agricultural co-operative societies in their marketing activities result in higher prices for the products of the farmers belonging to the societies. Thus farmers, who, it should be remembered, are also consumers, find their earnings increased and are able to get nearer to the best level of nutrition."

The co-operative organisations have tended, moreover, to reduce, by competition, distribution costs and consumers' prices in other sections of the economy. In some countries, they have been particularly effective in combating the influence of monopolies and cartels on retail prices of important foodstuffs.¹

In the case of large-scale non-co-operative enterprises, there is a danger that the considerable scope for economies of distribution may be counterbalanced by monopolistic exploitation. A large-scale centralised distributing organisation may be in a position both to drive a hard bargain with the primary producer, who is forced to get rid of his produce at any price offered, and at the same time to charge high prices to the consumers unchecked by the undercutting of competitors. In the case of such organised distribution, control may be necessary to secure that the economies of large scale are enjoyed by producers and consumers, and not merely used to build up monopoly profits for the distributor.

The fact that wages and salaries normally constitute the largest single element in distribution costs suggests that considerable scope for cost reduction may be offered by labour-saving devices such as mechanisation, or the elimination of handling processes. Mechanisation normally calls for considerable capital investment which is usually worth while only where distribution is organised on a large scale. The fact that mechanisation has been applied less in the distributive than in the productive sections of the economy may be largely due to the persistence of relatively small units in the former.

A reduction of the number of processes, the familiar " elimination of middlemen ", has been effected in some cases by the establishment of large central markets where producer and consumer (or retailer) can meet and themselves perform some of the services usually supplied by middlemen. In many centres on the Continent,

¹ Cf. H. STOLPE: " Co-operation and Monopolies in Sweden ", *International Labour Review*, July 1928.

distribution of foodstuffs at retail takes place several times in the week in market-halls or open market-places at prices substantially lower than those charged in retail shops. This procedure clearly eliminates or reduces considerably such costs as rent, transport, handling, packing, etc. Other efforts which have been applied in the same direction include retailing and delivery by producers, and, at the retailing end, non-credit retail stores, which eliminate credit costs and bad debts, and where, in some cases, a certain amount of self-service in the shop and the transport to his home are performed by the purchaser himself.

A high proportion of the margin of distribution is necessarily due to transport costs. These have, in some cases, been improved by efficiency of packing and loading, which economises space, and also by large-scale organisation, which has eliminated duplication and the carrying of goods over unnecessary distances between producer and consumer.

Another important cost element consists of rents. The concentration of stocks and the reduction in the number of retail stores have, in some countries, contributed to the cutting-down of this element. On the other hand, it has sometimes been found desirable to increase stocks of commodities of which the supply is irregular, in order to stabilise prices both to producers and consumers and thereby to reduce the cost of the risk factor.

Finally, particular attention is being paid to the problem of waste; attempts are made to reduce waste through the immediate elimination of spoilt goods, through increased use of refrigeration and cooling during storage, transport and retailing, and through better distribution of shipments as to both time and place.

In the United States and in some other countries, methods of intensive market research have been developed with a view to forecasting local demand, so as to avoid the shipment of goods to a market where remunerative sales cannot be assured.

50. It has been possible here to mention only a few of the points at which efforts for reducing distribution costs are being applied. The problem calls for detailed investigation in particular countries and industries. One of the essential conditions for such investigations is clearly the development of more exact cost-accounting by those engaged in distribution. In this connection, the promotion of the collection of distribution-cost statistics by the Economic Institute

for Small Traders in the Netherlands may be mentioned as a successful attempt to deal with this problem.¹

51. A particularly important field calling for improved methods of distribution is offered by the milk trade. A plentiful, regular, cheap and hygienic milk supply is one of the main essentials of satisfactory nutrition. A special problem arises from the fact that production is subject to greater seasonal fluctuations than consumption, yielding a summer "surplus" of milk which has to be disposed of outside the liquid market, and consequently at lower prices; organisation of the liquid-milk market is therefore bound up with that of various milk products. The complex problem of milk distribution seems to call for regional or national organisation.

52. It is clear that an improvement in the efficiency of the distribution of foodstuffs must be a primary element in nutrition policy. Certain steps have already been taken in the establishment of consumers' committees and the periodic setting-up of Government commissions of enquiry to give special consideration to consumers' interests in connection with distribution. Too often, unfortunately, action has stopped short at this point. Anomalies have been pointed out, excessive margins discovered, and suggestions made for improved organisation; it is essential that these preliminary analyses of the defects of the existing system should be followed by an active policy of reform and reorganisation.

¹ Cf. F. L. VAN MUISWINKEL: "Distribution Cost Statistics for the Retailer". International Congress for Scientific Management, London, 1935.

Chapter 5.

THE RELATION OF INCOME TO NUTRITION.

1. In the two preceding chapters, an attempt was made to indicate the relationship between prices and consumption and to analyse the factors determining the price of food to the consumer. The quality of nutrition, however, depends upon the amount of money available for food in relation to food prices, and the wisdom and intelligence with which it is spent. The present chapter and that which follows will accordingly be devoted to an analysis of the rôles of income and education in determining nutritional levels.

2. The data on which the following analysis is based refer almost exclusively to urban populations. This is due not to an under-estimation of the importance of the problem of the nutrition of agriculturists, but to the less dominant rôle played by money income in determining farmers' consumption, owing to the production of food for family consumption on the farm. The following figures relating to three Canadian provinces illustrate the importance of this factor even in a country where farming is conducted largely on a market and not a subsistence basis:

Table I.

PERCENTAGE VALUES OF LEADING FOOD GROUPS PRODUCED ON THE FARM
AND PURCHASED, 1934.^a

	Alberta (523 households)		Ontario (512 households)		Saskatchewan (639 households)	
	Produced on farm	Purchased	Produced on farm	Purchased	Produced on farm	Purchased
Meats	87	13	72	28	91	9
Butter and cheese	89	11	64	36	90	10
Flour	43	57	21	79	27	73
Canned goods . .	10	90	21	79	6	94

^a British Commonwealth Scientific Conference, Canadian Preparatory Committee: Report of the Subcommittee on Nutrition. Ottawa, August 1936.

An analysis of the problem of the nutrition of farm families is confronted by particular difficulties owing to the scarcity of records

of the home consumption of foods produced on the farm. At the same time, it is along the lines of such production for family consumption, and its guidance in accordance with the directives furnished by nutritional science, that the most hopeful approach to the problem of the nutrition of farm families lies.

3. To ascertain the rôle of income in determining nutrition, two main types of investigations may be employed. First, by examining data on family living classified according to income classes the changes in consumption which accompany changes in income may be ascertained and the nutritional implications of those changes examined. Secondly, the cost of minimum adequate diets which have been laid down by nutrition authorities may be compared with the sums available for expenditure on food in various classes of the community and with the allowances available for food by those in receipt of relief assistance.

A. RELATION OF INCOME TO FOOD EXPENDITURE.

4. It is an almost universal rule of experience that, in the family of the average worker, the total sum spent on food increases with total income. This may be illustrated by the following figures from the family expenditure studies in Poland (1928) and in Belgium (1928/29).

Table II.

FOOD EXPENDITURE AND TOTAL INCOME.

Poland. ^a		Belgium. ^b		
Income	Average expenditure on food	Income	Average expenditure on food	
Per consumption unit <i>c</i>		Per quet <i>c</i>		
Zloty	Zloty	Francs	Francs	
599 and below.	345	Under 200	126	
600-899	452	200-300	169	
900-1,199	465	300-400	201	
1,200 and over	712	400 and over.	225	

^a *Statystyka Polski*, Tome XL, zeszyt 1. Warszawa, 1930.

^b Armand JULIS: "Résultats principaux d'une enquête sur les budgets d'ouvriers et d'employés en Belgique (1928/29)", *Bull. de l'Institut international de Statistique*, XXVIII, 1934.

^c The consumption unit is a device for rendering comparable observations from families of different types —i.e., different size, age and sex composition. A scale of relative consumption requirements of individuals of different ages and sexes is used to convert the data obtained from the original observations relating to

[Continued on following page.]

5. Expenditure on food is influenced, not only by the limitations of total income, but also by habits, tastes and conventional standards of living, which again vary with occupation, degree of urbanisation and family type. In general, wage-earners spend a larger proportion of their income on food, and less on "keeping up appearances", clothes, rent, furniture, etc., than do clerical or professional families receiving similar incomes. The influence of the type of employment on the proportion of total expenditure devoted to food can be seen in Diagram I on page 245, which shows the sums spent on food by different general occupational groups having the same income per "consumption unit".¹

Wage-earners generally pay less rent than clerical and professional families with the same income. In a German enquiry (1927/28), it was found that wage-earners generally lived in smaller apartments than professional families, although the quality, as measured by the proportion of rent to floor or air space, was about the same in different occupational groups with the same incomes. The importance of rents in determining the amount of income available for food has frequently been emphasised. In Stockton-on-Tees, England, it was found that workers' families which were transferred from slum dwellings to a modern housing estate suffered seriously in health as compared with those who remained in the slums, owing to the necessity for paying a larger proportion of their incomes for

[Continuation of footnote from preceding page.

different families into comparable units. For example, in scale (a) below, the consumption requirements of a child aged 5 are taken as equal to half the requirements of a grown man.

In practice, a number of different scales of requirements have been used, but most of them have been based on calorie requirements only. In fact, however, the relative requirements of the various nutrients do not bear a fixed proportion to the requirements of calories throughout all ages or for both sexes. The application of a calorie requirement scale to the intake of proteins, minerals and vitamins and of specific foodstuffs, or for the purpose of classification into income groups, has therefore a distorting effect on the results. Exact scales of requirements for various nutrients have not yet been internationally agreed upon; the degree of distortion can, however, be gauged to some extent from the table given in footnote a on page 253 which indicates the differences between the relative requirement scales used by the U.S. Bureau of Home, Economics, for calories, for various minerals and vitamins and for the cost of adequate diets generally. Unfortunately, most studies on family living from which the illustrative matter of this chapter is drawn suffer from the distorting effects of applying calorie requirement scales only; it has been necessary to make use of this material in default of better. The question of establishing scales of relative requirements for various nutrients is at present being studied by the Technical Commission on Nutrition of the Health Organisation of the League of Nations, and it is to be hoped that future family living studies will be able to take advantage of the work of that Commission.

In the material quoted in this chapter, a number of different scales of relative calorie requirements have been used. A reference table of these different scales is given below; in subsequent examples, the particular scale used is always indicated. In Table II above, the scale used for the Polish data is (a), and that of the Belgian data (b). In the latter, a "quet" represents the requirements of a child under 1 year.

[Continued on following page.

¹ The scales *c* and *d* respectively are employed for conversion into consumption units in the data for Czechoslovakia and Sweden. For the German data, scale *f* is used for food consumption, and an average of *f* and *g* (non-food requirements) for income.

rent, and in consequence not having enough available for an adequate diet.¹

The effects of rent restriction (*Mieterschutz*) on total food expenditure can be seen from the table on the next page, taken from a Czechoslovak enquiry into family living (1929/30).²

[Continuation of footnote from preceding page.]

On the question of the degree of difference involved in the use of different calorie scales, see International Labour Office: "Workers' Nutrition and Social Policy", page 41.

VARIOUS SCALES USED FOR CONSUMPTION UNITS.

Age Years	<i>a</i>		<i>b</i>		<i>c</i>		<i>d</i>		<i>e</i>		<i>f</i>	
	Male	Female	M	F	M	F	M	F	M	F	M	F
0 . .	0.25		1.0		0.1		0.15		0.43		0.50	
1 . .	0.25		1.1		0.1		0.15		0.43		0.50	
2 . .	0.40		1.2-1.5		0.1		0.15		0.43		0.50	
3 . .	0.50		1.2-1.5		0.1		0.15		0.43		0.50	
4 . .	0.50		1.2-1.5		0.2		0.40		0.43		0.50	
5 . .	0.50		1.2-1.5		0.2		0.40		0.43		0.50	
6 . .	0.50		1.6-1.9		0.2		0.40		0.43		0.50	
7 . .	0.50		1.6-1.9		0.3		0.75		0.80		0.50	
8 . .	0.60		1.6-1.9		0.3		0.75		0.80		0.50	
9 . .	0.60		1.6-1.9		0.3		0.75		0.80		0.50	
10 . .	0.60		2.0-2.3		0.4		0.75		0.80		0.75	
11 . .	0.60		2.0-2.3		0.4		0.90		0.80		0.75	
12 . .	0.70		2.0-2.3		0.4		0.90		0.80		0.75	
13 . .	0.70		2.0-2.3		0.5		0.90		0.80		0.75	
14 . .	0.85	0.75	2.4-2.6	2.4-2.6	0.5		0.90		0.80		0.75	
15 . .	0.85	0.75	2.4-2.6	2.4-2.6	0.7	0.6	1.0	0.90	0.95		1.00	0.90
16 . .	0.85	0.75	3.5	2.4-2.6	0.7	0.6	1.0	0.90	0.95		1.00	0.90
adult												
17 . .	0.85	0.75	3.5	3.0	0.9	0.7	1.0	0.90	1.00	0.90	1.00	0.90
18 . .	1.00	0.85	3.5	3.0	0.9	0.7	1.0	0.90	1.00	0.90	1.00	0.90
19 . .	1.00	0.85	3.5	3.0	1.0	0.8	1.0	0.90	1.00	0.90	1.00	0.90
20 . .	1.00	0.85	3.5	3.0	1.0	0.8	1.0	0.90	1.00	0.90	1.00	0.90
Age Years	<i>g</i>		<i>h</i>		<i>i</i>		<i>j</i>		<i>k</i>			
	M	F	M	F	M	F	M	F	M	F		
0 . .	0.20		0.47		0.20		0.15		0.2			
1 . .	0.20		0.47		0.25		0.20		0.2			
2 . .	0.20		0.54		0.30		0.30		0.3			
3 . .	0.20		0.59		0.35		0.35		0.3			
4 . .	0.20		0.59		0.45		0.40		0.4			
5 . .	0.20		0.59		0.50		0.45		0.4			
6 . .	0.30		0.60		0.53		0.50		0.5			
7 . .	0.30		0.60		0.57		0.55		0.5			
8 . .	0.30		0.71		0.60		0.60		0.5			
9 . .	0.30		0.71		0.63		0.65		0.6			
10 . .	0.50		0.80		0.66		0.70		0.7			
11 . .	0.50		0.80		0.70		0.75		0.7			
12 . .	0.50		0.90		0.73		0.80		0.8			
13 . .	0.50		0.90		0.76		0.85		0.8			
14 . .	0.50		1.00	0.83	0.80		0.90		1.0	0.8		
15 . .	0.70		1.00	0.83	0.83	0.80	1.00	0.90	1.0	0.8		
16 . .	0.70		1.00	0.83	0.86	0.80	1.00	0.90	1.0	0.8		
17 . .	0.70		1.00	0.83	0.89	0.80	1.00	0.90	1.0	0.8		
18 . .	0.70		1.00	0.83	0.93	0.83	1.00	0.90	1.0	0.8		
19 . .	0.70		1.00	0.83	0.96	0.86	1.00	0.90	1.0	0.8		
20 . .	1.00	0.90	1.00	0.83	1.00	0.86	1.00	0.90	1.0	0.8		
Over 60												0.8

¹ MCGONIGLE and KIRBY, "Poverty and Public Health" (London, 1936).

² *Mitteilungen des Statistischen Staatsamtes der Tschechoslowakischen Republik*, 1934, Nos. 31-34.

Table III.

THE EFFECTS OF RENT RESTRICTION ON FOOD EXPENDITURE (CZECHOSLOVAKIA).

Incomes	Percentage expenditure on food:					
	Workers		Salaried employees		Officials	
	With rent restriction	Without rent restriction	With rent restriction	Without rent restriction	With rent restriction	Without rent restriction
Kr.						
Under 16,000 . .	61	53	54	52	55	48
16,001-30,000 . .	55	51	50	45	44	40
30,001-60,000 . .	50	50	57	41	38	36
Over 60,000 . . .					22	22

A somewhat similar investigation relating to German workers in the textile, brewing and metal industries was made in 1931.¹ This investigation showed that the level of consumption of the inhabitants of new houses was more adversely affected by the depression than that of the inhabitants of old houses. Moreover, scarcity of old dwellings prevented the return of workers from new to old apartments as a result of falling income.

The following table relating to these groups of workers in Germany shows the movement of the "real income available for consumption" (*i.e.*, earnings minus wage tax, insurance premiums and rent) as compared with 1913 (= 100):

Table IV.

INCOME AVAILABLE FOR CONSUMPTION BY INHABITANTS OF OLD AND NEW HOUSES (GERMANY).

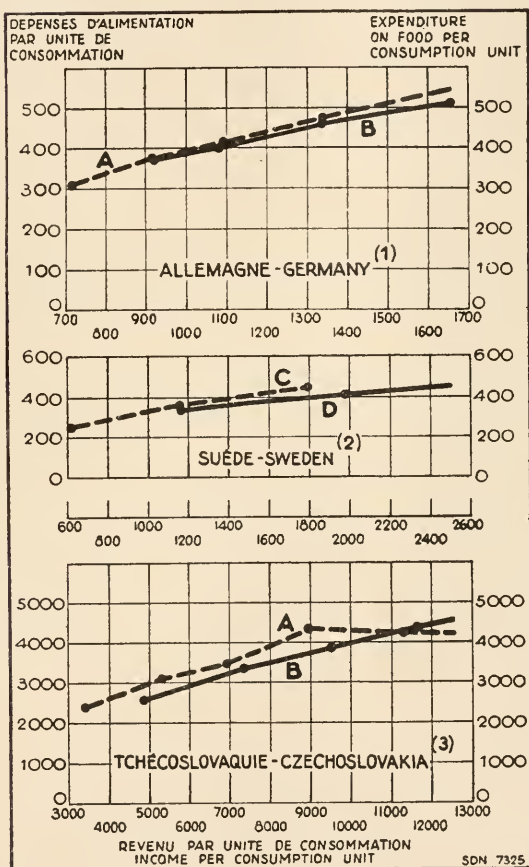
	1930		May 1931	
	Old houses	New houses	Old houses	New houses
	(September)			
Textile industry (1913 = 100):				
Skilled workers (male)	100	81	97	77
Assistants (male)	103	84	93	74
	(1930)			
Brewing industry (1913/14 = 100):				
Brewers	101	82	105	82
Drivers	117	95	120	95
Assistants	116	94	118	91
	(October)			
Metal industry (1913/14 = 100):				
Skilled workers	88	71	85	68
Semi-skilled workers	91	75	89	71
Assistants	93	74	91	72

¹ By Dr. Franz FÜRTH. See *Wirtschaftskurve*, Heft III, 1931.

Diagram I.

AMOUNTS SPENT ON FOOD BY DIFFERENT OCCUPATIONAL
AND INCOME GROUPS.

- A Workers.
- B Officials.
- C Workers and lower officials.
- D Middle-class families.



(1) *Einzelschriften zur Statistik des Deutschen Reiches*, No. 22.

(2) *Sociala Meddelanden*, No. 12, 1934.

(3) *Mitteilungen des Statistischen Staatsamtes der Tschechoslowakischen Republik*, 1931, Nos. 43-44.

It is evident from the examples given in this paragraph that a policy directed towards improving nutrition standards must at the same time take into account other essentials of livelihood.

There are in every community certain generally accepted norms of consumption in respect of housing, clothing, recreation, etc., as well as in respect of food. Although it might be theoretically possible to attempt to raise one of these norms at the expense of the others, it would be difficult and, in most cases, undesirable to do so. Adequate shelter, clothing and recreation are also essential for well-being and health. It would therefore appear that the more hopeful approach is that of attempting to raise the absolute amount of incomes and to secure a more nutritionally desirable distribution of food expenditures.

6. Owing to differences in local prices, taxation levels, etc., the sums available for expenditure on food out of identical incomes tend to vary as between different localities, and particularly as between urban and rural areas.

7. Apart from these various external influences—of occupation and community interests, the level of rents, the size of towns, etc.—there is a general tendency governing the relation between income and food expenditure: as income rises, the absolute sum spent on food increases, but the percentage of income so spent falls. Bearing in mind the reservations regarding the external influences indicated above, a lower proportionate expenditure on food can normally be regarded as a symptom of a higher plane of living, both for consumers and, to some extent, for the economy as a whole.

B. RELATION OF TOTAL FOOD EXPENDITURE TO NUTRITION.

8. The influence of total food expenditure on nutrition is a double one: improvements both in the quantity and quality of diet generally accompany a higher outlay on food.

9. The purely quantitative aspect may be seen from the following examples:

Table V.

THE RELATION OF INCOME TO CALORIES, PROTEIN AND FAT CONSUMPTION.

Sweden. ^a

Workers and lower officials :

Income per consumption unit Kr.	Daily consumption per consumption unit ^b		
	Calories	Proteins Grammes	Fats Grammes
Below 700.	3,120	85	112
700-1,450	3,480	95	134
1,450 and over	3,840	104	152

Germany. ^c

Workers :

Annual income per consumption unit RM	Daily consumption per consumption unit ^d	
	Calories	Proteins Grammes
Under 800	2,530	69
800-1,000	2,771	77
1,000-1,200	2,858	82
1,200-1,500	2,966	87
1,500 and over	3,193	95

United Kingdom. ^e

Income per head per week Shillings	Daily consumption per head of		
	Calories	Proteins Grammes	Fats Grammes
Up to 10	2,317	63	72
10-15	2,768	76	99
15-20	2,962	84	110
20-30	3,119	89	121
30-45	3,249	94	131
Over 45	3,326	98	142

^a *Sociala Meddelanden*, 1935, No. 3 (610 families).

^b Scale *d*.

^c *Einzelchriften zur Statistik des Deutschen Reiches*, No. 22, Teil I, page 95.

^d Scale *f* for consumption and average of *f* and *g* for income.

^e Estimates given in "Food, Health and Income", by Sir John Boyd ORR, page 34.

10. The improvement in the quality of diet which usually accompanies an increase in total food expenditure is to be explained by the fact that the more nutritive or protective foods are almost always more expensive as sources of energy than foods of less nutritive value. The first consideration must necessarily be to secure a minimum quatum of calories, at least sufficient to still the pangs of hunger. Where income is restricted, this quatum of calories will be obtained from the cheapest available sources; and this, unfortunately, sometimes precludes the procuring of enough

animal proteins, minerals and vitamins, which are chiefly derived from the foods which are relatively expensive as sources of calories.

The following table gives the cost of purchasing 100 calories of different foodstuffs in Switzerland (1936), Belgium (1932), Italy (1933) and Denmark (1936).

Table VI.

COST OF 100 CALORIES OBTAINED FROM VARIOUS FOODS.

<i>Switzerland (1936).^a</i>			
	Centimes		Centimes
Flour (wheat)	1.04	Pears ^b	8.85
Sugar	1.07	Carrots ^b	10.39
Oatmeal	1.29	Cabbage ^b	10.90
Barley	1.30	Pork	11.41
Bread	1.48	Honey	11.75
Rice	1.59	Peas	11.96
Macaroni	1.68	Eggs, foreign ^b	12.06
Potatoes (by 100 kg.) . .	2.28	Eggs, home produced ^b . .	(14.51)
„ (by 1 kg.)	(3.04)	Mutton	13.36
Lard	2.36	Oranges ^b	14.92
Prunes (dried)	3.58	Bananas ^b	18.56
Cocoa	4.09	Spinach ^b	23.21
Milk	4.37	Tomatoes, home produced ^b	23.80
Bacon	5.23	Tomatoes, foreign ^b . . .	(26.42)
Apples ^b	6.08	Veal	25.00
Butter	6.12	Cod	48.57
Beans	7.63	Chicken	63.39
Cheese	7.83		
<i>Belgium (1932).^c</i>			
	Franc		Franc
Bread	0.06	Fresh beef	0.77
Lard	0.12	Pork cutlets	0.83
Potatoes	0.13	Fruit	0.90
Margarine	0.18	Vegetables	0.95
Butter	0.24	Eggs	1.00
Milk	0.28		

^a Calculated on the basis of scale of calorie values given in SHERMAN: "Chemistry of Food and Nutrition" (Appendix B), and official retail-price statistics (*La Vie Economique*).

^b Prices during the cheapest quarter.

^c E. J. Bigwood and G. Roost: "L'Alimentation rationnelle". Brussels, 1934, page 229.

Table VI (continued).

Italy (1933). ^a		Denmark (1936). ^b	
	Centesimi		Øre
Beans and other dried veget- ables	2.06	Bread (rye, black)	0.8
Maize flour	2.74	Sugar (half refined) . . .	1.0
Figs and dried prunes . .	3.01	„ (cut)	1.4
Rice	4.15	Potatoes	1.4
Chestnuts	4.31	Vegetable margarine . . .	1.5
Wheat flour	4.67	Rice	1.6
Potatoes	8.21	Oatmeal	1.8
Butter	15.00	Lard	2.1
Sugar	15.69	Dried peas	2.5
Milk	15.86	Bread (white)	2.8
Fresh fruit	20.60	Butter	3.0
Citrus fruit	25.88	Prunes	3.8
Pork	28.41	Milk	4.4
Green vegetables	30.51	Fresh herrings.	8.8
Cheese	33.34	Eggs	8.8
Beef	34.59	Beef (fore-quarter)	9.7
Mutton, goat.	39.82	Veal (fore-quarter)	12.3
Eggs	48.05	Beef (hind-quarter)	12.4
Bananas.	84.16	Cod	14.4
Fresh and frozen fish . .	87.21	Filet (beef ?)	16.7

^a *Annuario Statistico Italiano*, 1935, page 164.

^b *Statistiske Efterretninger*, No. 4, February 6th, 1929, page 30; and *Annuaire statistique danois*, 1936, page 95 (publication of the Statistical Department).

In spite of minor differences, it will be seen that, in most cases, the sources of "good protein" and foods rich in mineral and vitamin content tend to concentrate at the more expensive end of the scale. This applies particularly to fruit, vegetables, meat, fish and eggs; while dairy products, also highly "protective", occupy an intermediate position.

It should not be thought, however, because the protective foods tend to be expensive as sources of calories, that they are expensive foods. On the contrary, Table VII below shows that they are relatively cheap as sources of minerals and vitamins—nutrients to which the new science of nutrition attaches particular importance. The table, which is taken from an American study¹ covering

¹ "Nutritive Value of Diets of Families of Wage-earners and Clerical Workers in North Atlantic Cities, 1934/35" in *Monthly Labor Review* (Washington, July 1936).

employed wage-earners in North Atlantic cities in the winter of 1934/35, compares the proportion of their total food expenditure which these families allotted to seventeen different groups of food, and the proportion of their total consumption of calories and various nutrients derived from these groups of foods.

Table VII.

AVERAGE DISTRIBUTION OF EXPENDITURES AMONG, AND PERCENTAGE OF NUTRITIVE VALUES SECURED FROM, SPECIFIED GROUPS OF FOOD (UNITED STATES).

(Families spending \$2.38 to \$3.00 weekly per food-cost unit. ^a)

Food group	Percentage of food money allocated	Percentage furnished of:								
		Calo-ries	Pro-tein	Cal-cium	Phos-phorus	Iron	Vita-min A	Vita-min B	Vita-min C	Vita-min G (B ₆)
Eggs	4.96	1.69	4.88	2.73	4.07	6.33	6.04	2.83	0	5.33
Milk, cheese, ice-cream . . .	12.14	9.79	15.96	60.67	26.40	6.06	13.90	12.42	5.28	34.23
Butter, cream	7.57	9.32	0.42	1.44	0.77	0.52	16.00	0.16	0	0.43
Other fats	2.96	7.82	0.51	0.10	0.68	0.73	0.84	0.01	0	1.06
Meats, poultry, fish	25.51	12.91	36.17	2.73	24.58	31.83	7.14	37.42	0.67	32.22
Sugar and sweets	4.21	12.37	0.15	2.09	0.34	2.59	0	0	0	0
Bread and other baked goods	13.80	19.93	16.90	9.32	11.70	11.28	2.83	4.67	0.52	5.11
Ready-to-eat cereals	0.53	0.69	0.74	0.44	2.43	1.53	0.02	1.04	0	0.46
Flour and other cereals . . .	3.28	9.63	9.62	2.27	7.00	6.31	0.64	2.40	0.11	0.12
Potatoes, sweet potatoes . .	1.47	5.82	4.37	3.38	7.80	11.41	2.60	13.41	22.83	7.18
Dred legumes, nuts	1.82	2.90	5.26	3.41	6.75	8.70	0.22	8.67	0	0.80
Tomatoes	1.49	0.34	0.38	0.47	0.61	0.64	9.52	1.99	7.82	0.60
Citrus fruit	3.15	1.05	0.51	3.00	0.88	1.84	0.56	5.27	29.56	3.30
Leafy, green, yellow veget- ables	3.89	0.82	1.42	3.38	2.26	3.72	33.70	4.16	12.76	3.69
Other vegetables	3.43	1.04	1.00	2.79	1.73	2.08	1.28	1.57	8.12	1.23
Other fruits	3.88	2.77	0.69	1.42	1.54	4.14	4.63	3.75	12.33	3.86
Miscellaneous items	5.91	1.11	1.02	0.35	0.46	0.29	0.07	0.23	(b)	0.38
Total	100	100	100	100	100	100	100	100	100	100

^a See footnote a, page 253.

^b Less than 1/100 of 1 %.

II. The improvement in diet which accompanies rising income is, then, chiefly due to the fact that calories are purchased from more varied and expensive sources which are usually, although not always, more nutritive. The price paid per 10,000 calories in Sweden by families with different incomes per head is shown in the following figures:

Table VIII.

RELATION OF INCOME TO PRICE OF CALORIES.

<i>Sweden (1933).^a</i>	
Income per consumption unit ^b Kr.	Cost of 10,000 calories Øre
<i>Workers :</i>	
Below 700.	250
700-1,450	310
1,450 and over	369
<i>Middle-class families :</i>	
1,005-1,530	295
1,530-2,585	373
2,585 and over	442

^a *Sociala Meddelanden*, 1935, No. 3, page 188.

^b Scale *d*.

12. A very rough measure of the nutritive quality of a diet is given by the proportion of calories and proteins derived from animal and vegetable sources. In the following examples (Table IX), taken from the German and Polish family budget enquiries, a steady increase in the percentage both of proteins and calories derived from animal sources will be seen to accompany a rising income per consumption unit.

Table IX.

NUTRITIONAL ANALYSIS OF DIETS OF GERMAN AND POLISH WORKERS.

Total expenditure per consumption unit ^b Zloty	Protein			
	Animal		Vegetable	
	Grammes	%	Grammes	%
Below 600.	12.9	25.65	37.4	74.35
600-899	24.0	37.21	40.5	62.79
900-1,199	32.1	42.97	42.6	57.03
1,200 and over	44.6	52.97	39.6	47.03

^a "Budget des familles ouvrières, 1927". *Statystyka Polski*, Tome XL, zeszyt 1.

^b Scale *a*.

Table IX (continued).

	Calories			
	Animal		Vegetable	
		%		%
Below 600.	326.8	13.68	2,061.4	86.32
600-809	575.7	20.28	2,263.0	79.72
900-1,199	756.1	23.95	2,400.3	76.05
1,200 and over	987.8	29.84	2,322.5	70.16

German Workers (1927/28).^a

Annual income per consumption unit ^b RM.	Protein			
	Animal		Vegetable	
	Grammes	%	Grammes	%
Under 800	30.7	44.62	38.1	55.38
800-1,000	38.2	49.42	39.1	50.58
1,000-1,200	42.7	52.01	39.4	47.99
1,200-1,500	48.5	56.07	38.0	43.93
1,500 and over	55.5	58.30	39.7	41.70

	Calories			
	Animal		Vegetable	
		%		%
Under 800	895	35.38	1,635	64.62
800-1,000	1,036	37.39	1,735	62.61
1,000-1,200	1,104	38.63	1,754	61.37
1,200-1,500	1,219	41.10	1,747	58.90
1,500 and over	1,313	41.12	1,880	58.88

^a *Einzelchriften zur Statistik des Deutschen Reiches*, No. 22.

^b Scale *f* for protein and calorie intake; average of scales *f* and *g* for incomes.

13. A more exact analysis of the nutritive value of diets purchased at different food expense levels has been made for certain employed wage-earners and low-salaried clerical workers in the United States in 1934-1936 by the Bureau of Home Economics, Department of Agriculture.¹ The following table shows per "nutrition unit" ² the average annual energy value and content of various nutritive elements consumed by families with different food expense levels in the North Atlantic region, December 1934-February 1936.

¹ "Diets of Families of Wage-earners and Low-salaried Clerical Workers living in Industrial Communities in Three Regions of the United States, 1934-1936." Bureau of Home Economics, February 1937. (Mimeographed.)

² Bureau of Home Economics scales. See footnote, page 253.

Table X.

RELATION OF INCOME TO INTAKE OF CALORIES AND VARIOUS NUTRIENTS
(UNITED STATES).

(Value per nutrition unit.)^a

Weekly food expenditure per food cost unit ^b	Energy value Calories	Protein Grammes	Calcium Gramme	Phosphorus Grammes	Iron Gramme	Vitamin A International units	Vitamin B ₁	Vitamin C units	Vitamin G (B ₂) Sherman units
1.33-1.99 . . .	2,540	64	0.440	1.08	0.0114	5,740	100	800	470
2.00-2.66 . . .	2,960	74	0.546	1.25	0.0133	7,700	120	1,150	580
2.67-3.32 . . .	3,370	88	0.663	1.47	0.0155	9,380	150	1,400	700
3.33-3.99 . . .	3,830	98	0.737	1.62	0.0173	11,760	170	1,750	820
4.00-4.66 . . .	4,130	116	0.841	1.87	0.0203	15,820	200	1,950	950

^a A "nutrition unit" is taken by the Bureau of Home Economics to represent 3,000 calories, 70 gm. protein, 68 gm. calcium, 1.32 gm. phosphorus, 0.015 gm. iron, 8,400 International units vitamin A (= about 6,000 Sherman units), 150 International units vitamin B₁ (= about 600 Sherman units), and 600 Sherman units vitamin G (B₂). The following scales of relative requirements for different ages and sexes have been used for comparing the content of calories and various nutrients in the diets.

Individuals by age and sex	Cost	Energy value	Protein	Calcium	Phosphorus	Iron	Vitamin A	Vitamin B ₁	Vitamin C	Vitamin G (B ₂)
Child under 4 years . . .	60	40	70	150	80	40	75	40	70	75
Boy 4-6; girl 4-7 . . .	70	50	80	150	80	50	75	50	70	75
Boy 7-8; girl 8-10 . . .	90	70	100	150	80	70	90	70	70	90
Boy 9-10; girl 11-13 . .	95	80	110	150	90	80	90	80	80	90
Boy 11-12; girl 14-19 . .	100	83	110	150	90	90	100	83	90	100
Boy 13-15 years . . .	110	100	110	130	100	100	100	100	100	100
Boy 16-19 years . . .	112	120	110	130	100	100	100	120	120	100
Woman 20-74 years . . .	95 (To be	100	100	130	100	100	100	100	100	100
Man 20-74 years . . .	100	determined	100	100	100	100	100	100	100	100
Over 75 years . . .	90	daily)								

^b A "food cost unit" is a consumption unit based on the cost of adequate diets for individuals of different ages and sexes as shown in the table in footnote ^a.

^c The content of these diets in respect of vitamins A, B and C was expressed, in the original document from which this table is taken, in terms of Sherman units, as follows:

Weekly food expenditure per food cost unit	Vitamin A	Vitamin B (B ₁)	Vitamin C
\$			
1.33-1.99	4,100	400	80
2.00-2.66	5,500	490	115
2.67-3.32	6,700	580	140
3.33-3.99	8,400	680	175
4.00-4.60	11,300	790	195

Owing to the fact that Sherman units and International units are computed according to quite different principles, no exact conversion is possible. The Sherman units for vitamins A, B₁, C and G (B₂) are biological units, based on the biological response of animals—a response subject to great variation under apparently similar conditions of experiment. The International units for Vitamins A, B₁, C and D, on the other hand, are based upon the vitamin activity of standard, stable materials, appropriately chosen for vitamins A, B₁, C and D respectively, these standard materials in suitable dosage being simultaneously included in every test as standards of comparison. The expression of the quantities of vitamins A, B₁ and C in terms of International units in the above table are based on the following approximate conversion coefficients computed by Dr. Harriette Chick, of the Lister Institute:

Vitamin A:	1 Sherman unit equivalent to	1.4 International units
Vitamin B ₁ :	" " " " " "	0.25 " "
Vitamin C:	" " " " " "	10 " "

No international standard or unit at present exists for vitamin G (B₂).

Both quantitatively and qualitatively, an improvement takes place as the total food expenditure per food-cost-unit increases.

Similar data relating to European urban families in South Africa ¹ are given below in Table XI.

Table XI.
CONSTITUENTS OF FOOD CONSUMED PER MAN-UNIT ^a PER DAY
(UNION OF SOUTH AFRICA).

Annual family income	Proteins (grammes)				Fats (grammes)	Carbo-hydrates (grammes)
	Milk	Other animal products	Vegetable products	Total		
Up to £125	6	30	65-67	101-103	60-68	626-633
£125-£150	6	32	60-61	98-99	59-66	561-569
£150-£175	7	31-32	58	96-97	63-72	551-557
£175-£200	8	36-37	61-62	105-107	70-78	581-594
£200-£225	11	35-36	53-55	99-102	74-82	531-542
£225-£250	14	41-42	57-59	112-115	93-105	585-600
£250-£275	12	39-40	55-56	106-108	85-97	529-544
£275-£300	15	39-41	56-57	110-113	91-102	543-560
£300-£325	15	41-43	56-58	112-116	95-108	550-569
£325-£350	17	44-46	57-60	118-123	106-121	569-592
£350-£375	17	45-47	57-59	119-123	108-121	566-588
£375-£400	16	42-45	55-57	113-118	102-115	539-562
£400-£425	17	45-47	56-58	118-122	107-122	555-577
£425-£450	17	43-46	56-58	116-121	108-122	556-581
£450-£475	17	47-50	56-58	120-125	109-124	553-580
£475-£500	16	51-54	56-58	123-128	110-125	561-588
£500-£525	17	49-51	52-55	118-123	111-125	530-557
£525-£550	18	50-54	55-58	123-130	114-129	543-573
£550-£575	17	49-51	52-55	118-123	112-127	544-571
£575-£600	18	50-54	58-60	126-132	117-131	558-587
Average all groups .	15	43-45	56-58	114-118	98-110	554-574

^a Consumption-unit scale *k*; cf. page 243.

Annual family income	Calcium (milli-grammes)	Phosphorus (milli-grammes)	Iron (milli-grammes)	Calories
Up to £125	494-507	1,643-1,685	22-23	3,576-3,683
£125-£150	481-494	1,560-1,603	21-22	3,301-3,395
£150-£175	494-503	1,529-1,560	20-21	3,282-3,396
£175-£200	592-612	1,672-1,740	22-23	3,502-3,647
£200-£225	673-688	1,641-1,696	21-22	3,323-3,453
£225-£250	851-872	1,857-1,933	23-24	3,791-3,975
£250-£275	758-776	1,731-1,795	22-23	3,453-3,634

¹ Union of South Africa, Office of Census and Statistics, 1937: "Enquiry into the Expenditure of European Families in Certain Urban Areas, 1936".

Table XI (continued)

Annual family income	Calcium (milli-grammes)	Phosphorus (milli-grammes)	Iron (milli-grammes)	Calories
£275-£300	875-897	1,812-1,893	22-23	3,577-3,759
£300-£325	895-918	1,896-1,984	24-25	3,655-3,864
£325-£350	998-1,023	1,975-2,073	24-26	3,868-4,113
£350-£375	997-1,022	1,990-2,086	25-26	3,875-4,101
£375-£400	952-977	1,868-1,965	23-25	3,681-3,912
£400-£425	1,012-1,034	1,967-2,058	24-26	3,823-4,056
£425-£450	1,037-1,064	1,954-2,059	24-26	3,821-4,066
£450-£475	1,048-1,075	2,013-2,125	25-26	3,837-4,092
£475-£500	987-1,015	2,018-2,134	25-26	3,893-4,156
£500-£525	1,054-1,082	1,976-2,090	25-26	3,751-4,009
£525-£550	1,081-1,110	2,044-2,175	25-27	3,844-4,116
£550-£575	1,013-1,040	1,966-2,079	24-25	3,815-4,074
£575-£600	1,105-1,135	2,088-2,210	26-28	3,956-4,216
Average all groups	914-934	1,877-1,970	24-25	3,710-3,913

14. To illustrate further the point that the inferior composition of the diets obtained by the lower-income groups is largely necessitated by the exigencies of the price system, it may be interesting to cite some diets worked out by the Bureau of Home Economics in the United States as the best available at different costs.¹

Table XII.

FOUR DIETS AT VARYING LEVELS OF COST AND NUTRITIVE CONTENT
(UNITED STATES).

	Restricted diet for emergency use	Adequate diet at minimum cost	Adequate diet at moderate cost	Liberal diet
Flour, cereals lb.	240	224	160	100
Milk or equivalent quarts	155	260	305	305
Potatoes lb.	165	165	165	155
Dried beans, peas, nuts lb.	30	30	20	7
Tomatoes, citrus fruits lb.	50	50	90	110
Leafy, green and yellow vegetables lb.	40	80	100	135
Dried fruits lb.	10	20	25	20
Other vegetables and fruits . . . lb.	40	85	210	325
Fats (butter, oils, bacon, salt pork) lb.	45	49	52	52
Sugars lb.	50	35	60	60
Lean meat, poultry, fish lb.	30	60	100	165
Eggs dozens	8	15	15	30

¹ STIEBELING and WARD: "Diets at Four Levels of Nutritive Content and Cost". U.S. Department of Agriculture, Circular 296.

Optimum diets of the four types described in Table XII were calculated to cost respectively \$61, \$85, \$140 and \$165 per head per year at 1931/32 retail prices.

The percentage of calories obtained from the various foods are as shown in Table XIII.

Table XIII.
PERCENTAGE OF CALORIES FROM VARIOUS SOURCES IN THE
FOUR STANDARD DIETS.

	Restricted diet for emergency use	Adequate diet at minimum cost	Adequate diet at moderate cost	Liberal diet
Bread, flour, cereals	43	35	24	15
Milk	12	18	19	19
Fruit, vegetables	14	15	18	18
Fats	17	17	18	18
Sugars	9	7	9	9
Lean meat, fish, eggs . . .	5	8	12	21

It can be seen that, in the opinion of the authors of these diets, the most intelligent distribution of expenditure requires those with very low incomes to rely largely on bread, flour and cereals as sources of calories; and that it is only as income available for expenditure on food rises that it is considered advisable to draw a larger proportion of calories from highly nutritious foods such as milk, fruit, vegetables, meat, fish and eggs.

C. INCOME ELASTICITY OF DEMAND FOR VARIOUS FOODS.

15. The effects of rising income on the consumption of various foodstuffs have been clearly shown in the report on "Workers' Nutrition and Social Policy" of the International Labour Office (Chapter III, Section 3).¹ It is there demonstrated (see Diagram II opposite) that the consumption of bread and cereals tends to fall with increasing income, and that the consumption of fats (in particular margarine) shows the same tendency, though less distinctly, whereas the consumption of meat, fish, milk products, fruit and vegetables all rise steadily with rising incomes.

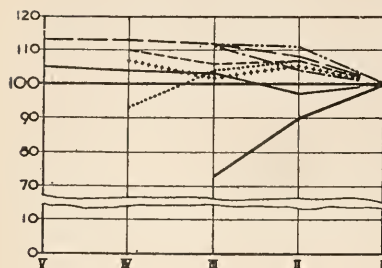
¹ "Workers Nutrition and Social Policy". Studies and Reports, Series B, No. 23 (Geneva, 1936).

Diagram II. ^a

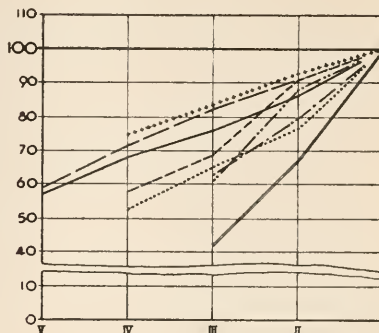
QUANTITIES OF FOODS CONSUMED IN DIFFERENT INCOME GROUPS.

(Consumption in the highest income groups in each case = 100.)

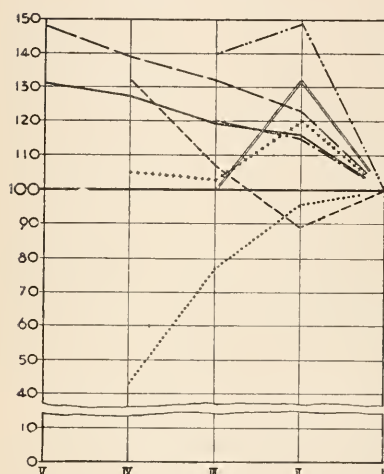
Cereals and bread



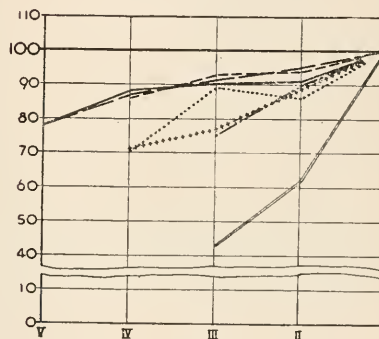
Meat and fish, etc.



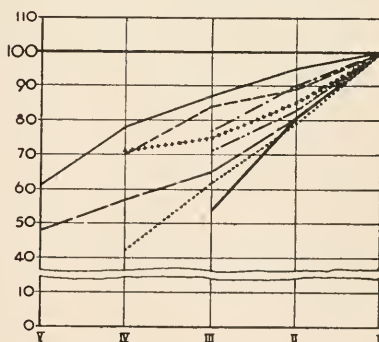
Margarine, fats, etc.



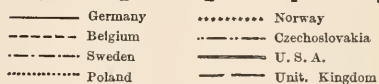
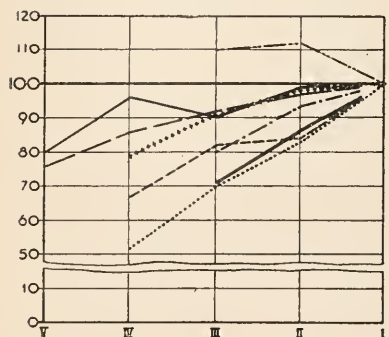
Vegetables and fruits



Milk, milk products and eggs



Sugar



Note. — The roman figures indicate income groups.

^a From International Labour Office: "Workers' Nutrition and Social Policy". Studies and Reports, Series B, No. 23 (Geneva, 1936).

16. Some examples, from the United States, Sweden and the Union of South Africa, may serve to illustrate the diversity of the reactions to increased income in the case of different food groups.

Table XIV.

RELATION OF ECONOMIC STATUS TO DEMAND FOR PARTICULAR FOODS.

United States of America (1935).^a

	Relative <i>per caput</i> consumption by families with annual expenditure per consumption unit <i>b</i> of:			
	Under \$300	\$300-\$399	\$400-\$499	\$500 and over
	%	%	%	%
Fruits, fresh, and juices	100	181	202	258
Fresh (non-leafy) vegetables.	100	124	185	249
Leafy vegetables	100	116	195	189
Meats, poultry, fish.	100	122	150	168
Eggs	100	134	145	168
Cheese	100	138	75	150
Butter and substitutes	100	124	124	133
Milk, cream and ice-cream	100	130	128	125
Potatoes	100	110	117	117
Bread	100	88	90	82

^a Faith WILLIAMS: "Food Consumption at Different Economic Levels", *Monthly Labour Review*, April 1936. Based on records of 181 families of wage-earners and lower-salaried clerical workers from representative cities in New England, U.S.A., spring 1935.

^b The consumption-unit scale employed is a composite one, based on relative expenditures of persons of different ages and sexes on food and clothing, and expenditure *per caput* on other items.

Sweden (1933).^a

Relative consumption per consumption unit *b* by families with income per consumption unit of:

	<i>Workers and lower officials</i>			<i>Middle-class families</i>		
	Below 700 kr.	700-1,450 kr.	1,450 kr. and over	1,005-1,530 kr.	1,530-2,585 kr.	2,585 kr. and over
	%	%	%	%	%	%
Cream	100	300	405	100	164	181
Fresh vegetables	100	167	233	100	132	204
Butter	100	151	205	100	131	171
Fruit	100	150	195	100	152	194
Eggs	100	146	171	100	135	163
Meat and bacon	100	126	163	100	111	130
Fish	100	133	152	100	102	128
Full milk	100	120	132	100	104	106
Cheese	100	119	129	100	102	115
Bread	100	111	126	100	137	123
Potatoes	100	108	110	100	104	119
Margarine	100	94	82	100	99	92

^a From *Sociala Meddelanden*, No. 12, 1934.

^b Scale *d*.

Table XIV (*continued*)
Union of South Africa (1936).^a

	Relative consumption per consumption unit ^b by families with incomes of:		
	Up to £175 %	£325-£400 %	£525-£600 %
Bacon	100	1,830	2,230
Eggs	100	596	822
Milk (fresh)	100	390	430
Cheese	100	322	372
Fish (fresh)	100	235	333
Vegetable and fruit (value)	100	246	314
Butter	100	186	206
Jam and syrup	100	190	204
Meat (fresh)	100	112	112
Potatoes	100	99	92
Oatmeal, rice, maize meal	100	96	88
Sugar	100	92	88
Bread and flour	100	74	70
Tea and coffee	100	71	59
Milk, condensed	100	42	15

^a Union of South Africa, Office of Census and Statistics, 1937: "Enquiry into the Expenditure of European Families in Certain Urban Areas, 1936".

^b Scale *k*.

In each case, important increases are to be seen in fruit, vegetables, dairy produce, meat and eggs; all these changes improve the quality of the diet.

17. Changes may also be observed in the composition of the separate groups of food in response to rising income. As regards the relative consumption of different fats, an improvement in nutritional quality is normally found to accompany increased expenditure.

Table XV.
RELATION OF INCOME TO QUALITY OF FAT CONSUMPTION
AMONG GERMAN WORKERS ^a (1927/28).

(Percentage expenditure on various fats.)

	Annual income per consumption unit ^b				
	Under RM 800	RM 800- 1,000	RM 1,000- 1,200	RM 1,200- 1,500	RM 1,500 and over
Butter	26.6	37.1	43.3	52.4	62.4
Crude fat	3.9	4.1	3.2	2.8	2.4
Lard and dripping . .	16.2	14.2	14.0	10.8	9.6
Margarine	47.1	38.5	32.8	28.3	19.3
Oil and vegetable fats.	6.2	6.1	6.7	5.7	6.3

^a *Einzelschriften zur Statistik des Deutschen Reiches*, No. 22.

^b Average of scales *f* and *g* for income; scale *j* for fat expenditure.

18. In the case of bread, the influence of rising income is often contrary to the proscriptions of nutritional experts. Thus, in a number of countries, consumers with higher food expenditure purchase a larger proportion of refined white bread and less of the more nutritious wholemeal breads. In the Scandinavian countries, however, the contrary tendency is usually to be observed.

D. INFLUENCE OF SIZE AND AGE OF FAMILY.

19. As most food purchasing is conducted for the family household as a whole, not only the family income, but also the number of persons and the composition of the family are of importance in determining the adequacy of nutrition.

20. A clear correlation is normally to be found between the size of families and both family income and income per consumption unit. In general, the larger the family the larger is family income, but the smaller is the income per consumption unit. The first relation arises from the greater earning possibilities of members of the family other than the head, while the second is due to the necessity for dividing an income, normally derived at least mainly from one source, among an increased number of family members. The effect of a larger family in increasing family income is generally more marked among workers than among middle-class families, where the age at which children begin to earn tends to be higher and where their earnings are generally small in relation to those of the head of the family.

21. The influence of an increase in the number of young children on consumption per consumption unit is, for the main part, similar to that of a decrease in income: both quantity and quality of diet tend to fall¹ so long as income is not adjusted to meet the increased needs. As in the case of a reduction of income, the necessity for supporting a more numerous family on a given income generally leads to an increase in the proportion of total expenditure devoted to food, but a decrease in the absolute food expenditure per consumption unit.²

¹ Cf. *Einzelschriften zur Statistik des Deutschen Reiches*, No. 22, page 72.

² *Mitteilungen des Statistischen Staatsamtes der Tschechoslowakischen Republik*, 1933, Nos. 199-207.

The accompanying table indicates the effect of size of family on individual consumption among certain Czechoslovak workers.¹ It can be seen that, with an increase in the number of children, the unit consumption of butter, milk, eggs, cheese, fruit and vegetables tends to fall, while that of bread, potatoes and artificial fats show the opposite tendency; in short, if income is unchanged, when the size of a family increases, diet appears to become more filling but less nutritious.

Table XVI.

RELATION OF FAMILY SIZE TO CONSUMPTION PER CONSUMPTION UNIT ^a
OF VARIOUS FOODS AMONG CZECHOSLOVAK WORKERS (SEVENTY-NINE FAMILIES).

Family income: Below 16,000 Kr.			16,001-30,000 Kr.						30,001-40,000 Kr.		
Number of consumption units:	1.8-2.5	2.6-3.4	1.8-2.5	2.6-3.4	3.6-4.3	4.6-4.7	5.9-6.1	4.3-4.4	5.0	5.6-6.2	
Butter kg.	5.63	3.81	7.5	4.0	3.9	1.4	0.4	5.6	4.8	2.0	
Milk litre	217	182	238	189	146	114	117	179	161	130	
Eggs number	224	134	237	226	136	69	135	177	160	122	
Cheese . . . crowns	37	20	45	38	22	18	24	30	42	25	
Fruit crowns	132	62	142	122	61	83	36	152	101	86	
Vegetables. . crowns	109	86	123	96	81	37	47	71	91	55	
Potatoes . . . kg.	126	86	89	114	76	117	114	67	136	137	
Bread kg.	88	96	86	120	117	171	116	106	127	133	
Artificial fat. . kg.	2.6	3.0	2.3	3.5	2.5	8.6	5.6	1.4	0.7	6.9	

^a Scale c.

Similarly, from the German family budget enquiry it appeared that families with four children spent per consumption unit 75 % less on butter, 60 % less on eggs, 64 % less on fruit, 54 % less on vegetables, 52 % less on meat and meat products and 54 % less on fish than families with the same income but without children. On the other hand, they spent 37 % more on black bread (but 35 % less on white bread), 26 % more on potatoes and 71 % more on margarine.²

22. Where the income is inadequate and the family large, there is thus particular danger of nutritional deficiencies. This is the more disturbing in view of the emphasis laid by nutritional experts

¹ *Mitteilungen des Statistischen Staatsamtes der Tschechoslowakischen Republik*, 1931, Nos. 225-229, page 1862; see also *ibid.*, 1933, Nos. 199-207, page 1570.

² TYSZKA: "Ernährung und Lebenshaltung des Deutschen Volkes" (Berlin, 1934), page 40.

on the particularly ill effects of malnutrition on the young. The reassuring doctrine that "with every mouth is born a pair of hands" is cold comfort for parents with a large family of small children whose mouths require feeding, but whose hands are not yet capable of contributing anything towards the process. The danger of malnutrition seems particularly serious in such cases.

23. Perhaps the most significant feature of the deterioration of nutrition to be found in large families among the lower-income groups is the decline in the consumption of milk. Milk has been established by nutrition experts to be not only the most valuable element in the diet of children, but also an element for which no substitute has been found. A decline in milk consumption by young children is therefore practically synonymous with a deterioration in their nutrition.

In an enquiry into the milk consumption of 1,000 poor families attending infant welfare centres in Durham, England, the average weekly quantity of fresh milk purchased per head was found¹ to decrease steadily with an increase in the size of the family.

Table XVII.
RELATION OF FAMILY SIZE TO MILK CONSUMPTION.
(DURHAM, ENGLAND.)

Number in family	Av. fresh milk purchased per head per week Litres	Number in family	Av. fresh milk purchased per head per week Litres
2	0.74	8	0.17
3	0.40	9	0.17
4	0.28	10	0.15
5	0.23	11	0.15
6	0.23	12	0.11
7	0.23		

A similar tendency among workers in Czechoslovakia can be seen from Table XVI above, and the same phenomenon was shown in an enquiry covering 9,728 families in fifty-nine cities of the United States in 1936.² All the families consisted of two adults

¹ Mrs. C. H. BURNS: "Study of Milk Consumption in County Durham", *Journal of State Medicine*, Vol. XLI, No. 7.

² "A Survey of Milk Consumption in Fifty-nine Cities in the United States." Consumers' Counsel Division Agricultural Adjustment Administration, Dept. of Agriculture, June 1936.

and varying numbers of children; an almost constant decrease in *per caput* milk consumption is seen to accompany an increase in the number of children.

Table XVIII.

RELATION OF FAMILY SIZE TO MILK CONSUMPTION
(UNITED STATES: FIFTY-NINE CITIES).

Children in family	Weekly consumption per head of whole milk and whole-milk equivalent of evaporate milk Litres	Children in family	Weekly consumption per head of whole milk and whole-milk equivalent of evaporate milk Litres
0	3.15	6	1.82
1	3.48	7	1.70
2	3.33	8	1.66
3	2.97	9	1.68
4	2.60	10	1.39
5	2.19		

The following table shows the *per caput* milk consumption in families in Minneapolis, U.S.A., of varying composition. They are classed in two different groups according to income per head, so that the direct relation of family size to milk consumption (and not only the indirect effect exercised through income) may be seen.¹

Table XIX.

RELATION OF FAMILY SIZE TO MILK CONSUMPTION
(MINNEAPOLIS, U.S.A.).
(In litres per head per day)

Number of children	Per caput income below \$300 Number of adults				Per caput income \$300-\$599 Number of adults				
	2	3	4	5	1	2	3	4	5
0 . .	0.39	0.42	0.36	0.30	0.62	0.54	0.45	0.41	0.38
1 . .	0.48	0.43	0.43	0.38	—	0.60	0.53	0.51	—
2 . .	0.56	0.46	0.43	0.43	—	0.59	0.55	0.53	—
3 . .	0.51	0.43	0.39	—	—	0.62	—	—	—
4 . .	0.49	0.60	—	—	—	—	—	—	—
5 . .	0.47	—	—	—	—	—	—	—	—

A general tendency can be seen for the consumption of milk per head to increase in families containing a larger, and to decrease

¹ WAITE and COX: "Study of the Consumption of Dairy Products in Minneapolis, 1934." University of Minnesota, Agricultural Experiment Station, Bulletin 311, October 1934.

in those containing a smaller, proportion of children to adults. The tendency corresponds to the prescriptions of nutrition experts, and, like other such prescriptions, is more clearly to be discerned in the higher than in the lower income group.

24. It has been shown above that nutrition in large families tends to be inferior to that of smaller families, owing to the reduction of income per consumption unit which normally accompanies an increase in the size of the family. In a recent enquiry in Sweden, it has been suggested that large families tend to enjoy less adequate nutrition than small families, for other reasons in addition to the reduction of income per head usually involved.¹ The following table shows the consumption of three family type groups containing respectively the following number of consumption units: 1.9 (families without children), 2.8 (families with two children under 7 years) and 4.1 (families with two or three children, one or more 15 years or over). The income per consumption unit varies within relatively narrow limits.

Table XX.

RELATION OF FAMILY TYPE TO CONSUMPTION OF CALORIES
AND VARIOUS NUTRIENTS (SWEDEN).

Consumption units ^a per family	1.9	2.8	4.1
Income per family kronor	2,559	3,640	5,750
Income per consumption unit . . . kronor	1,347	1,300	1,401
Calories	3,732	3,393	3,304
Calories (animal)	1,711	1,575	1,502
Proteins grammes	100	97	94
Animal proteins grammes	62	60	57
Fat grammes	146	134	130
Butter-fat grammes	65	62	58
Carbohydrates grammes	461	420	393
Calcium grammes	1.27	1.29	1.09
Phosphorus grammes	1.90	1.89	1.70
Iron milligrammes	18	17	16

^a Scale *e*.

From this table, it would appear that, even when income per consumption unit is similar, an increase in the size of family is accompanied by a decreased consumption of practically all nutrients.

¹ Dr. ERNST ABRAMSON: "Preliminary Report on the Composition of Swedish Diets." Stockholm, 1937.

If the tentative results of the Swedish investigation are confirmed by other investigations elsewhere, it will serve to reinforce the conclusion already reached that particular attention, through family allowances, provision of supplementary food, education and other means, must be paid to the question of nutrition of children.

E. ADEQUACY OF INCOME FOR NUTRITION.

25. The preceding sections have been mainly directed towards demonstrating the influence of income on actual consumption. An alternative approach to the question of the relationship between income and nutrition is to compare the minimum cost of adequate diets in various countries with the incomes actually available for the purchasing of such diets. A study along these lines requires a close acquaintance with local conditions, available foodstuffs, relative prices, climate, occupations, family composition and earnings, level of non-food expenditure, etc. Unfortunately, not many such studies appear to have been made; an interesting example may, however, be cited from Stockton-on-Tees, in the north of England.¹

Family expenditure accounts were collected from 141 employed families selected as representative of their class. The irreducible expenses on non-food items (rent, fuel and light, insurance, doctor, household utensils and cleaning, clothing, subscriptions, etc.) were subtracted from net income (wages minus statutory deductions for unemployment and health insurance) in order to calculate the weekly sums available per man value for food purchase. The result is shown in the following table:

Table XXI.

DISTRIBUTION OF FAMILY INCOME AND FOOD EXPENDITURE PER MAN VALUE
(STOCKTON-ON-TEES, ENGLAND).

Family income	% of cases	Sums available for food purchase per man value <i>a</i>
25s.-35s.	33	4s. 3 <i>d.</i>
35s.-45s.	28	4s. 4 <i>d.</i>
45s.-55s.	22	4s. 11 <i>d.</i>
55s.-65s.	12	5s. 9½ <i>d.</i>
70s.-80s.	5	8s. 1½ <i>d.</i>

a Scale *h.*

¹ MCGONIGLE and KIRBY, *op. cit.*

These figures may be compared with the cost of a specimen diet laid down by the British Medical Association as the minimum requisite to maintain health and working capacity. Such a diet was calculated to cost 7s. per man value, at retail prices ruling at Stockton-on-Tees in June 1935. From the above table, therefore, it appears that a large proportion of the families included in the enquiry had not enough money available for expenditure on food to purchase what is considered to be a minimum adequate diet. It is impossible to say to what extent this sample is representative of the general situation in Great Britain. Sir John ORR (in Chadwick Lecture, 1934) estimated the number of those living "near or below the threshold of adequate nutrition" as a result of deficiency of income as about 10 millions; MCGONIGLE and KIRBY¹ even regard this as an understatement.

An indication of the situation in the United States is given by STIEBELING and WARD in connection with their calculation of diets at various cost levels. The cheapest diet—"restricted diet for emergency use"—cost, as 1931/32 retail prices, \$61. The diet was intended to provide minimum nutritive requirements, allowing little safety margin, and not recommended for use over long periods. It is stated that this diet had a higher retail value than the food which could be purchased out of the relief allowances received by the unemployed during 1931-1933. It was further added that, "unfortunately, many families find it necessary, even in normal times, to live for long periods on supplies of food less plentiful and less well balanced than the restricted diet here suggested for emergency use".

The following preliminary results of an enquiry conducted by the Bureau of Labour Statistics shows the percentages of representative samples of families of employed wage-earners and lower-salaried clerical workers which spent sufficient on food to obtain the "adequate diet at minimum cost" recommended by the Bureau of Home Economics. The prices with which the quantities of the adequate diet were weighted were average prices; it is possible that, by careful shopping, these foodstuffs could have been obtained at less than average prices.

¹ *Op. cit.*, page 191.

Table XXII.

PERCENTAGE OF FAMILIES WITH ANNUAL FOOD EXPENDITURES LARGE ENOUGH TO BUY THE BUREAU OF HOME ECONOMICS "ADEQUATE DIET AT MINIMUM COST".

Region, city and State	Year ending <i>a</i>	Cost of adequate diet <i>b</i>	Number of families		Percentage of families spending per adult <i>c</i> equivalent:			
					Enough for adequate diet <i>b</i>		Not enough for adequate diet <i>b</i>	
		\$	White	Negro	White	Negro	White	Negro
<i>North Atlantic:</i>								
Boston, Mass. . .	28.II.35	122.25	516		73.6		26.4	
Buffalo, N.Y. . .	29.II.36	125.35	450		76.9		23.1	
Manchester, N.H. .	31.VIII.34	116.56	146		63.0		37.0	
New York, N.Y. . .	31.V.35	130.30	897	100	87.3	64.0	12.7	36.0
Philadelphia, Pa. .	30.XI.34	120.18	498	101	75.3	39.6	24.7	60.4
Pittsburgh, Pa. . .	30.XI.34	116.40	346	97	67.6	38.1	32.4	61.9
Portland, Me. . . .	29.II.36	131.17	153		49.7		50.3	
Scranton, Pa. . . .	30.XI.34	122.26	231		72.7		27.3	
<i>East North Central:</i>								
Cincinnati, O. . .	29.II.36	127.39	352	100	81.8	42.0	18.2	58.0
Cleveland, O. . . .	31.V.36	126.84	490		80.0		20.0	
Detroit, Mich. . . .	28.II.35	102.00	598		89.5		10.5	
Indianapolis, Ind. .	29.II.36	120.14	203	101	67.0	29.7	33.0	70.3
Milwaukee, Wisc. .	29.II.36	120.43	446		76.5		23.5	
<i>West North Central:</i>								
Denver, Colo. . . .	28.II.35	111.04	295		83.1		16.9	
Kansas City, Mo. .	29.II.36	125.48	357	103	56.9	37.9	43.1	62.1
Minneapolis and St. Paul, Minn. . .	29.II.36	123.92	504		67.5		32.5	
St. Louis, Mo. . . .	29.II.36	125.68	401	106	76.8	46.2	23.2	53.8
<i>Pacific:</i>								
San Francisco . . .	31.V.35	127.84	446		85.9		14.1	
Seattle, Wash. . . .	28.II.35	115.27	352		80.4		19.6	
<i>Southern:</i>								
Baltimore, Md. . .	29.II.36	128.65	419	107	68.0	24.3	32.0	75.7
Birmingham, Ala. .	30.XI.34	118.01	202	101	56.9	15.8	43.1	84.2
Houston, Tex. . . .	29.II.36	120.22	258		67.4		32.6	
Jacksonville, Fla. .	31.VIII.35	127.66	178		65.7		34.3	
Memphis, Tenn. . .	30.XI.34	112.53	194	94	62.4	27.7	37.6	72.3
Mobile, Ala.	28.II.35	113.31	146	94	50.7	12.8	49.3	87.2
New Orleans, La. . .	30.XI.34	107.03	318	83	67.6	30.1	32.4	69.9
Norfolk- Portsmouth, Va. . .	29.II.36	128.02	162	109	63.6	21.1	36.4	78.9
Richmond, Va. . . .	30.XI.34	118.51	193	96	55.4	20.8	44.6	80.0

a In most of the cities included in the investigation, some of the data apply to months before and after the year indicated in this column, but in all cases, except New York City, more than 50% of the data apply to the year given.

b Bureau of Home Economics adequate diet at minimum cost for a man at moderate work in the year to which the greater part of the expenditure figures apply.

c Number of adult equivalents per family measured in terms of adequate-food-cost units, based on relative cost of adequate diet at minimum cost for persons of different age and sex.

Apart from the possibility of reducing non-food expenditure—which, as already indicated, is usually restricted—it can be seen that considerable proportions of the employed population, and particularly of the negro families, in most of these towns were suffering from malnutrition *owing to insufficiency of income*. Probably the proportion whose diets actually were defective was considerably greater, since many of the families may have been less skilful in apportioning their food expenditure than is assumed by the Bureau of Home Economics.

F. DETERMINANTS OF INCOMES.

26. The preceding sections of this chapter have shown that income exercises a considerable influence on nutrition, particularly among the lower-income groups, where, even in countries with the highest planes of living, it is in some cases so restricted that the purchase of an adequate diet becomes an economic impossibility.

27. Two classes of income influences may be distinguished: those affecting the size of the national dividend as a whole, and those affecting its distribution among different groups of income-receivers.

28. The factors determining national income may again be separated into two distinct classes. In the first place, there are the secular, long-term influences—the degree of economic development, the availability of natural resources, accumulation of capital, efficiency of labour, etc. The effects of the secular rise in national income and in the general plane of living on food-consumption habits have been indicated in Chapter I.

29. The trend of growth in the national income has, unfortunately, seldom taken the form of a smooth, uninterrupted process. It has been characterised by alternating advances and recessions, a wave-like movement which towards the end of the nineteenth century had become familiar in all the more developed industrial countries as the phenomenon of the “business cycle”. The second type of determinant of the total national income, which may be characterised as “business-cycle influences”, affects the efficiency of the utilisation of available resources—*i.e.*, the degree

to which the long-period maximum of the national income is approached at any given moment of time.

30. The effects of the depression on adequacy of nutrition are not easy to determine. The violent shrinkage in the total monetary income in most countries during the recent depression was nowhere reflected in a general reduction of consumption corresponding in degree. One of the characteristic features of the crisis was the disproportionate fall in the prices of agricultural products, including foodstuffs. Hence the power to purchase food was, in most cases, diminished far less than the nominal money income of the community. In fact, an examination of the total national consumption of various foods during the depression years reveals scarcely any evidence of the general impoverishment prevailing. The reduction in food prices, combined with the long-term trend towards an increased consumption of protective foods, tended to counteract and outweigh the effects of reduced money incomes. Moreover, the unprecedented extent of public assistance during the recent depression modified considerably the effects of unemployment on national consumption.

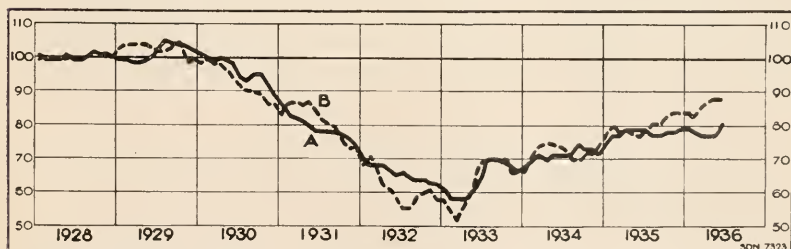
31. The accompanying chart for the United States shows that food prices fell by as much as the money earnings of employed factory workers between 1928 and 1933 (Diagram XII). This situation related, of course, only to workers who were continuously employed during this period.

Diagram III.

FOOD COSTS AND WEEKLY EARNINGS OF INDUSTRIAL WORKERS (1928-1936).

A Food-cost index (Bureau of Labor Statistics).

B Weekly earnings index (National Industrial Conference Board).



In some other countries—for instance, in Belgium—the fall in food prices was even considerably greater than the reduction in the earnings of employed workers.¹

32. For Great Britain, an index of wage-earners' purchasing power calculated by Professor Sargent FLORENCE shows an almost continuous rise from 1929 to 1935.² The index ((4) of Table XXIII) is composed of the estimated sum of the incomes of employed and unemployed workers divided by an index of the cost of living. A substitution of the Ministry of Labour food-price index for the general cost-of-living index reveals an even greater rise in wage-earners' food-purchasing power (5). Moreover, a comparison with the movement of the working population (6) disclosed that the food-purchasing power per head also showed a steady upward movement.

Table XXIII.

INDICES OF WORKERS' PURCHASING POWER (GREAT BRITAIN).

Year	Total working- class money income (1)	Cost of living (2)	Retail food prices (3)	General purchasing power (1) ÷ (2) (4)	Food- purchasing power (1) ÷ (3) (5)	Occupied population (employed and unem- ployed) (6)
1929	100.0	100.0	100.0	100.0	100	100.0
1930	97.8	96.3	94.2	101.5	104	102.3
1931	95.9	90.0	85.1	106.6	113	105.4
1932	92.7	87.8	81.8	105.6	113	105.6
1933	94.0	85.4	77.9	110.0	121	106.6
1934	97.3	86.0	79.2	113.1	123	107.4
1935	100.6	87.2	80.8	115.4	125	108.4

33. These figures suggest that the main incidence of the worst burden of the depression was on the unemployed, farmers and other primary producers. The fact that average national consumption, or even the average consumption of wage-earners, suffered no decline during the recent depression does not imply

¹ Cf. DUPRIEZ: "Salaires, prix et consommation dans la conjoncture économique de la Belgique depuis 1920": *Beiträge zur Konjunkturlehre*. Institut für Konjunkturforschung, Hamburg, 1936.

² "Index of Working-class Purchasing Power", *Journal of Political Economy*, October 1936.

that the depression was without its deleterious effects on the state of nutrition. The maintenance of the plane of living of those who remained in employment was counterbalanced by the sharp fall in the incomes of those who became unemployed; and the fall in food prices, which enabled consumers to maintain consumption standards in spite of falling money incomes, meant serious deprivation for farmers, whose purchasing power was reduced and who were compelled to sell a larger proportion of their output in order to obtain their necessary fixed money requirements, and could thus retain smaller quantities for their own consumption.

34. The effects of unemployment on nutrition in Austria and in Czechoslovakia are indicated by the following tables. The considerable fall in butter, fruit and vegetable consumption should be particularly noted.

Table XXIV.

ANNUAL CONSUMPTION PER CONSUMPTION UNIT^a OF EMPLOYED
AND UNEMPLOYED WORKERS' FAMILIES IN VIENNA (1934).^b

Food	Sixty-nine families (including the nineteen unemployed families)	Nineteen families (unemployed)	Ratio of second column to first %
Black bread kg.	80.25	92.41	+ 15.2
Pastry, etc. kg.	15.72	7.37	— 53.1
Whole milk litre	148.17	94.32	— 36.3
Skimmed milk litre	8.75	17.19	+ 96.5
Cheese kg.	3.21	2.80	— 12.8
Butter kg.	3.90	2.06	— 47.2
Margarine and vegetable fats . . kg.	2.82	2.24	— 20.6
Lard (melted) kg.	2.27	4.10	+ 80.6
Lard (unmelted) kg.	13.71	10.45	— 23.8
Meat other than horsemeat . . . kg.	41.01	26.16	— 36.2
Horsemeat kg.	0.68	1.91	+ 181.0
Fish kg.	1.59	0.62	— 61.0
Eggs Number	189	116	— 38.6
Vegetables. kg.	48.57	40.35	— 16.9
Potatoes kg.	55.67	59.35	+ 6.6
Fruit kg.	48.27	30.69	— 36.4

^a Scale i.

^b *Wirtschaftsstatistisches Jahrbuch*, 1936, page 292.

Table XXV.

FOOD CONSUMPTION PER CONSUMPTION UNIT^a OF THIRTEEN CZECHOSLOVAK FAMILIES DURING PERIODS OF EMPLOYMENT AND UNEMPLOYMENT.^b

Food	During employment, February 1931	During unemployment, February 1932	Ratio of second column to first %
Meat kg.	2.32	2.58	+ 11.2
Poultry kg.	0.23	—	— 100.0
Butter kg.	0.36	0.30	— 16.6
Pork fat kg.	0.71	0.66	— 7.0
Lard kg.	0.05	0.10	+ 100.0
Artificial fats kg.	0.43	0.35	— 18.6
Milk litres	14.28	13.83	— 3.2
Eggs number	12.22	15.03	+ 23.0
Flour, etc. kg.	5.09	4.89	— 3.9
Potatoes kg.	10.32	9.99	— 3.2
Sugar kg.	2.25	2.31	+ 2.7

^a Scale c.

^b From Dr. KOLLAR, Dr. REZŇY and Dr. NEČASOVÁ-POUBOVÁ: "Der Einfluss der Krise auf Familien beschäftigungsloser Arbeiter in der Tschechoslowakischen Republik", Table 13. Prague, 1933.

A deterioration in the quality of diets has been seen to accompany an increasing period of unemployment. The table given below shows the daily consumption per consumption unit¹ of proteins, fats and carbohydrates by families of Czechoslovak workers who had been unemployed for one to three months, four to twelve months, and over a year, respectively, in February 1932.²

Table XXVI.

EFFECT OF DURATION OF UNEMPLOYMENT TO NUTRITION
(CZECHOSLOVAKIA).

Protein:	Period of unemployment		
	1-3 months	4-12 months	over 1 year
Animal . . . grammes	41	33	25
Vegetable . . grammes	44	47	44
Total . . grammes	85	80	70
Fat grammes	93	85	62
Carbohydrates . . grammes	497	514	476

¹ Scale c.

² From "Der Einfluss der Krise auf Familien beschäftigungsloser Arbeiter in der Tschechoslowakischen Republik", Prague, 1933.

Particularly striking is the drastic reduction in fat consumption and in the consumption of animal protein; the latter is especially harmful in the case of children.

35. A study was made by the United States Children's Bureau in the autumn of 1934 of the effects of the depression on 259 families in five selected cities¹: 87 % of the families were found to be living on reduced incomes (unemployment or wage cuts): 49 % were living on half or less than half of previous income; and 73 % were living on three-quarters or less.

"Nearly every family that had suffered reduction in income mentioned the cutting-down of diets as one of the greatest hardships they had had to endure. The quantity and quality of meat had been lessened, eggs had been cut out and margarine had been substituted for butter; but the more serious deprivations seemed to be in the matter of fruits, vegetables and milk.

"Enquiry as to the amount and kind of fruits and vegetables used during the week prior to the study showed that in 61% of the families there was a lack of sufficient vegetables containing essential diet elements. In 20% of the families, the diet was almost totally deficient in respect to green vegetables and fruit, the chief articles of diet in these families being bread, beans and potatoes, with possibly cabbage once or twice a week, but no other green vegetables and no fruit. A still higher percentage of inadequate diets was found among the eighty-nine families that were on relief at the time of the study, 79% of this group lacking some of the essentials in fruits and vegetables, as compared with 52% of those not on relief. In 26% of the relief families and 17% of the non-relief families, the diet was almost entirely lacking in these respects.

"Fifteen per cent of the families on relief at time of interview and 6% of those not on relief bought no milk, fresh or canned, during the previous week: canned milk only was used by 25% of the relief families and by 13 % of the non-relief families."²

36. An investigation conducted by the Municipal Bureau of Statistics of Amsterdam³ enables a comparison to be made between the diets and living conditions of families of employed and unemployed workers in Amsterdam during the five months October 1934-February 1935. The families concerned were similar as regards composition, the occupation of the head of the family and the districts, and even streets, in which they lived. While the

¹ H. F. LENROOT: "Children of the Depression", *Social Service Review*, June 1935.

² *Op. cit.*, page 226.

³ *Statistische Mededeelingen van het Bureau van Statistik der Gemeente Amsterdam*, No. 105. Amsterdam, 1937.

employed families received an average income of 35.77 florins per week, the average incomes of the unemployed amounted to 19.09 florins, of which 14.03 florins consisted of unemployment assistance. Average weekly expenditure of the unemployed families was found to be 19.30 florins, implying an average deficit of 0.21 florin per week. The proportion of total income spent on food was surprisingly low—only 41.1%, as compared with 35.7% among the employed families. This was due to the relative fixity of non-food expenditure, in particular rents, which constituted 30.7% of the expenditure of the unemployed, as against only 18.3% for the employed. The reduced consumption of some important foods is shown in the following table:

Table XXVII.

NUTRITION OF EMPLOYED AND UNEMPLOYED IN THE NETHERLANDS:
EXPENDITURE PER CONSUMPTION UNIT ^a PER WEEK.

	Unemployed (cents)	Employed (cents)
Milk	24.5	38.2
Cheese	1.9	7.3
Meat	16.0	62.3
Fats	32.5	58.8
Vegetables.	11.5	21.3
Fruit	2.4	20.7

^a Scale *j*.

The decline in the quality of diet resulting from unemployment is, moreover, indicated by the fact that the employed families spent, on an average, 1.71 cents per 100 calories, while the unemployed spent only 1.07 cents.

37. In addition to the unemployed, the second important group whose plane of living in general, and of nutrition in particular, was very much lowered during the depression was the farmers. The fact that the price of farm products fell much farther and more violently than the prices of the commodities which farmers require to buy meant a severe curtailment of their purchasing power. On the one hand, less money was available for the purchase of such food as was not produced on the individual farm, and, on the other hand, in areas where farmers consumed largely their own produce,

a larger proportion of agricultural output had to be sold on the market in order to procure the necessary money for taxes, interest payments and other pressing demands, so that less remained for home consumption by the farmers and their families.

38. Besides the size of the national income and its fluctuations in the course of the business cycle, an important rôle in nutrition is exercised by the manner in which the national income is distributed among the population as a whole. A high average income and food supply is of little comfort to those below the average who are unable to purchase sufficient food to maintain health and efficiency.

39. There is, unfortunately, little information available regarding the distribution of income in most countries, and nowhere in a form which enables the sums spent on each individual to be easily calculated.

Some indication of the situation in the United States in 1929 (an exceptionally prosperous year) can be gathered from the estimates of the distribution of income by families (two or more persons) computed by the Brookings Institution.¹

Of the 21,674,000 non-farm families in the country, 2,735,000 (or 12.6%) were estimated to have an income of under \$1,000 per year, and spend on the average only \$350 on food; another 7,197,000 families (or 30%) had an income of \$1,000-\$1,500 per year, of which an average of \$490 was devoted to food. Since the "adequate diet at minimum cost" of the Bureau of Home Economics was computed, at 1929 prices, to cost approximately \$500 per year for an average family, it seems clear that at least 12% of all non-farm families, and probably a great many more, had, even in 1929, incomes insufficient to procure them an adequate diet.

Of the 5,800,000 farm families, 25% had incomes under \$500 per year, and another 30%, incomes of \$500-\$1,000 per year. (Farm incomes included allowances, at farm prices, for farm products consumed on the farm and for the rental value of farm homes.) The first group consumed, on the average, food valued at only \$250 per year, and the next group food valued, on the

¹ "America's Capacity to consume", Washington, 1934.

average, at \$400. The cost of an adequate diet was no doubt less for farm families; but 25 % of all farm families in the United States in 1929 consumed food valued at only \$250 per family, and it seems unlikely that they could have obtained a physiologically satisfactory diet.

The United States Bureau of Labour Statistics is at present engaged on a study of the distribution by income in 1936 of all families (including husband and wife) in certain towns of the United States. The Works Progress Administration has prepared an estimate of the cost of a maintenance budget for a family of four, for which the food costs were based on the Bureau of Home Economics adequate diet at minimum cost. The following table shows the percentage of white and negro families with incomes too low to purchase the Works Progress Administration maintenance budget:

Table XXVIII.

Town	Percentage of families (including husband and wife) with annual incomes in 1935/36 less than required to purchase Works Progress Administration maintenance budget		Average annual cost of maintenance budget (four persons) \$
	White families	Negro families	
Butte, Mont.	35.4	—	1,283.69
Chicago, Ill.	37.0	—	1,352.35 ^a
Columbia, S.C.	28.5	90.7	1,187.70
Columbus, O.	29.2	78.4	1,174.61 ^a
Denver, Colo.	41.0	—	1,242.23
Mobile, Ala.	38.8	92.3	1,125.07
Omaha, Nebr.	38.5	—	1,253.97
Portland, Ore.	39.8	—	1,217.97
Providence, R.I.	43.2	—	1,242.01
Atlanta, Ga.	34.4	89.6	1,263.68

^a Including sales tax where levied.

It is clear that more than a third of the white families, and almost all of the negro families, in most of these towns had incomes in 1936 insufficient to secure the Works Progress Administration maintenance budget.

An attempt has been made by Mr. Colin CLARK ¹ to give a rough estimate of the distribution of the incomes available per head of

¹ "National Income and Outlay." London, 1937.

the population of the United Kingdom. The following table summarises his results:

Table XXIX.

DISTRIBUTION OF POPULATION ACCORDING TO WEEKLY INCOME PER HEAD
(UNITED KINGDOM).

Income per head per week	All persons %	Children under 14 %
Up to 10s.	13.7	25.3
10s.-15s.	16.9	26.7
15s.-20s.	16.5	20.2
20s.-30s.	25.3	19.0
30s.-40s.	19.4	7.3
Over 45s.	8.1	1.5

According to Sir John ORR,¹ those with an income of under 10s. per week per head spent an average of 4s. per week on food, while the next group, with an income of 10s.-15s. per head per week, spent on the average 6s. per week on food. These figures may be compared with the costs of the British Medical Association standard diet, valued at July 1936 prices and adjusted to meet the recommendations regarding milk of the Technical Commission of the Health Committee of the League of Nations:²

Table XXX.

COST OF STANDARD DIETS FOR PERSONS OF DIFFERENT AGES
(UNITED KINGDOM).

Age	Male	Female
Over 70	4s. 1d.	4s. 1d.
14-70	6s. 9d.	5s. 9d.
6-14	5s. 5d.	5s. 5d.
Under 6	3s. 10d.	3s. 10d.

It is impossible to make a direct comparison between the figures relating to the distribution of the population according to expenditure per head and those relating to costs of standard diets which differentiate according to age and sex. A rough indication of the adequacy of funds available for family living, and therefore for

¹ "Food, Health and Income." London, 1936.

² R. F. GEORGE: "A New Calculation of the Poverty Line", *Journal of the Royal Statistical Society*, 1937, Part I.

food expenditure, may be obtained by taking the cost of an adequate diet for a typical family consisting of a married couple, one child aged 6-14 and one child under 6, and comparing it with actual incomes and expenditure on food according to the estimates of M. CLARK. A standard diet for such a family would cost 21s. 9d. per week; whereas, from Mr. CLARK'S figures, it appears that families of this composition in the lowest income group devote only 16s. per week to food, and cannot therefore obtain a diet of the British Medical Association standard (adjusted). Families and individuals spending at this level are estimated to constitute 13.7% of the population of the United Kingdom.

It may be sufficient to cite these estimates relating to the United States and the United Kingdom, where the general level of national income is relatively high, to indicate the importance of the distribution of income for the question of nutrition, and to suggest the even greater importance which it may have in relatively poorer countries.

40. A number of different measures has been applied for the purpose of raising or supplementing the incomes of those in the lower-income groups.

The various methods of regulating wage incomes—free collective bargaining, official recognition of the results of collective bargaining, their compulsory extension to workers in other spheres, the fixing of minimum wage rates for public authorities, for private industry and particularly for home work, family allowances, etc.—are discussed at length in several reports of the International Labour Office.¹ Such measures have undoubtedly contributed towards improving the levels of consumption of employed labour; the standards of living at which they aim, however, seldom take into specific account the essential requirements laid down by nutritional experts, and are generally based rather on existing levels of consumption or wage rates, which may be far from adequate from a nutritional point of view.

In addition to measures designed to raise the incomes of employed labour, considerable progress has been achieved in attempting

¹ Cf. International Labour Office: Studies and Reports—"Workers' Nutrition and Social Policy", Chapter VI (Series B, No. 23); "Minimum-wage-fixing Machinery" (Series D, No. 17); "Family Allowances" (Series D, No. 13).

to secure a certain stability of consumption by those who are unable to find employment, whether for economic or physical reasons. Many countries have established schemes of social insurance to provide against the worst hardships of unemployment; sickness, invalidity, old age, etc. As in the case of minimum-wage-fixing, however, insufficient account seems to be taken in general of nutritional requirements in the fixing of benefits to be paid under these schemes. "As a rule, social-insurance cash benefits are very modest. It could hardly be argued that they were fixed, in any countries, by taking genuine account of the costs of a minimum standard of living. The amounts of benefits paid in various countries represent a compromise between the maximum financial obligations it was not desired to exceed and the actual benefits it would have been desirable to give. Thus it cannot be maintained, as a general proposition, that the cash benefits payable under social-insurance plans provide sufficient and rational nutrition for insured workers and their families." ¹

Other more positive measures for improving incomes of unemployed workers have been applied through the various methods of employment creation introduced in most countries during the recent economic depression; public works, employment and other forms of subsidies, tax remissions, cheap money policies, etc. In so far as such measures have helped to stimulate general economic activity, they have not only contributed to raise the incomes of those for whom additional employment was provided, but have at the same time increased the national income as a whole.

Finally, the various forms of social provision of essential foods to particularly exposed sections of the population may also be regarded as measures designed to attack directly the problem of low incomes in relation to malnutrition. Where such measures are practicable, as in the case of the distribution of milk to pregnant and nursing mothers and the provision of milk or meals for school-children in schools, they form a particularly effective method of coping with the danger of malnutrition.

¹ International Labour Office: "Workers' Nutrition and Social Policy", page 128

Chapter 6.

THE RELATION OF EDUCATION TO NUTRITION.

A. INTRODUCTORY.

1. In the preceding chapter, it has been shown that income plays an important part in determining the nutritional adequacy of diets. It is, however, obvious that income is not the only influence. The connection between money expenditure and the level of nutrition is not a rigid one; there is an infinite number of ways of spending a given sum of money on food, and clearly some distributions of expenditure will give better results, from a nutritional standpoint, than others. This means, in short, that through publicity and education it is possible to influence habits of food consumption and induce consumers to distribute their food expenditure in a way which will secure for them a diet more adequate in essential nutritive properties than that which they now obtain with the same money outlay. Indeed, as has been shown in Part III, Chapter I, education and propaganda have already exercised a profound and beneficial influence on food habits in many countries.

2. Current discussions of nutritional problems frequently tend to stress either income or education as the main determinant of the state of nutrition, and to minimise the rôle of the factor which is not stressed. These two factors, however, are not alternatives, but joint determinants, though it is, of course, obvious that income will prove the more important factor to those with most restricted means, while education is important for all sections of the community.

B. SCOPE FOR INFLUENCING CONSUMPTION THROUGH EDUCATION.

3. To ascertain the general nature of the relation between expenditure on food and the quality of the diet purchased, it was sufficient to observe the relationship between average food expenditure in successive income groups and the corresponding average

consumption of various foods. In order to determine the scope for influences on consumption other than income, the same budgetary material can be used, but, in this case, attention must be concentrated, not on the average food consumption of the various income groups, but on the differences in the consumption of individual families *within* any given income group. If these differences are considerable, then it is obvious that the relationship between income and consumption is not rigid and that it is therefore possible to exert an effective influence on consumption through education or propaganda without touching incomes. If, on the other hand, differences in the consumption of individual families within an income group are not great, consumption standards may be assumed to be directly dependent on expenditure, and the possibility of consumption being influenced by purely educational means is inconsiderable.

4. Some interesting studies illuminating the point have been made by the Bureau of Home Economics in the United States. Actual diets purchased by nearly 900 families living at different levels of expenditure on food were classified as A, B or C diets,¹ and the distribution of A, B and C diets corresponding to these different levels were found to be as follows:

Table I.

QUALITY OF DIETS AT DIFFERENT LEVELS OF FOOD EXPENDITURE
IN THE UNITED STATES. ^a

Weekly food expenditure per food cost unit ^b	Percentage of records	Percentage of diets classed as:		
		A	B	C
\$1.33-\$1.99	37	4	35	61
\$2.67-\$3.32	51	35	59	6
\$4.00-\$4.66	12	77	20	3

^a From HAZEL STIEBELING: "Diets of Families of Employed Wage-earners and Low-salaried Clerical Workers living in Industrial Communities in Three Regions of the United States, 1934-1936". Bureau of Home Economics, Washington, February 1937.

^b "Food cost units" are based on the relative cost of adequate diets for individuals of different ages and sexes. Bureau of Home Economics scale. See footnote, page 253, Part III, Chapter 5.

¹ An A diet is one which meets average minimum requirements with a wide margin of safety in all respects; it furnishes, per adult consumption (nutrition) unit (see footnote, page 253, Part III, Chapter 5), 68 grammes or more of protein, 0.68 gramme or more of calcium, 1.32 grammes or more of phosphorus, and 0.015 gramme or more of iron per day. A B diet is one which meets average minimum requirements in all respects with an uncertain margin of safety; it provides, per

[Continued on following page.]

It is obvious that, as the level of food expenditure per head increases, there is a tendency for the quality of the diets to improve. In the lowest expenditure group, as many as 61% of the diets are classed as unsatisfactory; but, since 35% of those spending a similar amount on food managed to secure a class B diet, it may be concluded that no very exceptional skill or conditions were required for obtaining adequate nutrition at that food-expenditure level. In other words, if the 61% in the C class were to learn how the 35% in the B class distributed their food expenditure, they could presumably obtain an adequate diet, even without any increase in income. The fact that only 4% of diets in the lowest income group reached the A standard suggests that rather exceptional housekeeping skill was required; it is probable, however, that, if they were once let into the secret, at least some of those attaining only B diets might be enabled to reach the A level by education in domestic economy and the principles of nutrition. In the next two income groups, there seems no reason why all could not be instructed sufficiently to enable them to reach the A standard; in any case, the fact that 6% and 3% respectively are found in the C class in the two upper income groups can clearly be accounted for only by ignorance, and not by limitation of economic means.

5. A similar analysis was applied to farm families, 544 records extending over the period 1917-1932 being used and adjusted to allow for changes in prices.¹ Seven income groups were considered; in the lowest, the annual *per caput* money value of food was under \$32, while in the highest it ranged from \$193 to \$226. Here, none of the lowest group (which comprised only 2% of all records) obtained a grade A diet, and less than 10% obtained grade B, which suggests that, at least among this section of the farming population, malnutrition could be accounted for almost exclusively on economic grounds. The proportion of C diets decreases as

[Continuation of footnote from preceding page.]

nutrition unit, 45 grammes or more of protein, 0.45 gramme or more of calcium, 0.88 gramme or more of phosphorus, and 0.01 gramme or more of iron. Finally, a C diet is one which fails in one or more respects to meet minimum average requirements—i.e., it provides for one or more of the nutrients mentioned less than the amounts specified for diet B.

¹ U.S. Department of Agriculture: Agricultural Outlook Charts—"Farm Family Living and Summaries". (Washington, 1936.)

incomes rise, but a certain number of inadequate diets are to be found even in the fourth group, whose food was valued at between \$97 and \$129 per head per year; over half of this group secured A diets. Clearly, education might help to improve these few C diets, since expenditure was sufficient to procure A diets without any abnormal managing skill. The same fact applies to the B diets in the top three income ranges, where over 70% of the families in each case managed to reach the A standard.

6. The nutritive composition of the diets of families within the same food-expenditure group also varies widely. Table II, on the next two pages, shows an analysis of diets of seventy-three families divided into three such food-expenditure groups.

Adequate allowances of the various nutrients recommended by the Bureau of Home Economics are appended to indicate the degree to which these requirements are met in the different income groups. It will be seen that, even in the lowest income group, where insufficiency is found in most nutrients, there are some diets which attain the required standards (except in the case of calcium); while in the second group, where adequacy is reached in a considerable proportion of cases, there are still some cases of insufficiency in respect of each nutrient (cases of inadequate calcium intake appear even in the highest class). These deviations again suggest that considerable improvement could be effected by educational methods.

7. An analysis of a recent Swedish investigation into family living¹ reveals similar evidence of the scope for nutritional education. Although the average intake of various nutrients and of calories increased with increasing income, considerable dispersion was found in each income class, the dispersion in each class being about as great (measured by the coefficient of variation²) as was found for the whole population. Moreover, the relatively satisfactory level of the mean intake of most nutrients even in the lowest income class examined suggested that at least the greater part of the inadequate diets was to be explained by lack of skill in management and ignorance rather than by inadequate income.

¹ Ernst ABRAMSON: "Preliminary Report on the Composition of Swedish Diets." Stockholm, 1937 (mimeographed).

² Coefficient of variation = $\frac{\text{standard deviation}}{\text{mean}}$.

Table II.

DISTRIBUTION OF FOOD RECORDS, BY NUTRITIVE CONTENT PER NUTRITION UNIT ^a PER DAY, WINTER DIETS, 1934/35, IN NORTH ATLANTIC REGION ^b (FAMILIES OF EMPLOYED WAGE-EARNERS AND CLERICAL WORKERS).

Suggested requirements	Item	Number of records from families whose weekly <i>per capita</i> food expenditure was:			Total
		\$1.20-\$1.80	\$2.38-\$3.00	\$3.57-\$4.17	
	Energy value:				
3,300	Under 2,400 calories	9	0	0	9
	2,400-2,699	7	1	0	8
	2,700-3,299	2	10	1	13
	3,300-3,599	3	6	3	12
	3,600 calories and over . . .	2	19	10	31
	Protein:				
70	Under 45 grammes.	2	0	0	2
	45-69 grammes	13	2	0	15
	70-99 grammes	8	26	1	35
	100-119 grammes	0	8	4	12
	120 grammes and over . . .	0	0	9	9
	Calcium:				
0.68	Under 0.30 gramme	3	0	0	3
	0.30-0.44 gramme	13	5	0	18
	0.45-0.69 gramme	7	15	3	25
	0.70-0.99 gramme	0	15	7	22
	1 gramme and over	0	1	4	5
	Phosphorus:				
1.32	Under 0.88 gramme	6	0	0	6
	0.88-1.31 gramme	14	10	0	24
	1.32-2 grammes	3	24	8	35
	2 grammes and over	0	2	6	8
	Iron:				
0.15	Under 0.01 gramme	5	0	0	5
	0.01-0.0149 gramme	14	14	0	28
	0.015-0.0199 gramme	4	15	4	23
	0.02 gramme and over . . .	0	7	10	17

^a Bureau of Home Economics scales of relative nutritional requirements. See footnote, page 235, Part III, Chapter 5.

^b "Nutritive Value of Diets of Families of Wage-earners and Clerical Workers in North Atlantic Cities, 1934/35", *Monthly Labor Review*, July 1936.

Table II (continued).

Suggested requirements	Item	Number of records from families whose weekly <i>per capita</i> food expenditure was:			Total
		\$1.20-\$1.80	\$2.38-\$3.00	\$3.57-\$4.17	
Vitamin A:					
4,000-5,500	Under 3,000 International units ^a	5	0	0	5
	3,000-5,500 International units	8	15	0	23
	5,500-11,000 Internat. units .	7	17	8	32
	11,000 International units and over	3	4	6	13
Vitamin B (B ₁):					
125-200	Under 70 International units ^a	2	0	0	2
	70-125 International units .	15	6	0	21
	125-200 International units .	3	17	1	21
	200-250 International units .	3	11	4	18
	250 International units and over	0	2	9	11
Vitamin C:					
700-1,000	Under 500 International units ^a	2	0	0	2
	500-750 International units .	6	1	0	7
	750-1,000 International units	9	4	0	13
	1,000-1,500 Internat. units .	5	15	2	22
	1,500 International units and over	1	16	12	29
Vitamin G (B ₂):					
500-750	Under 300 Sherman units .	1	0	0	1
	300-499 Sherman units . . .	12	4	0	16
	500-749 Sherman units . . .	10	22	1	33
	750-999 Sherman units . . .	0	8	9	17
	1,000 Sherman units and over	0	2	4	6

^a The data relating to vitamins A, B₁ and C in the above table have been roughly converted from Sherman into International units by means of conversion coefficients computed by Dr. Harriette Chick and given in footnote *c* on page 253. The suggested requirements and classifications in the original table were as follows:

Suggested requirements:

Vitamin A:

3,000-4,000 Under 2,000 Sherman units
 2,000-3,999 Sherman units
 4,000-7,999 Sherman units
 8,000 Sherman units and over.

Vitamin B (B₁):

500-750 Under 300 Sherman units
 300-499 Sherman units
 500-749 Sherman units
 750-999 Sherman units
 1,000 Sherman units and over.

Vitamin C:

75-100 Under 50 Sherman units
 50-74 Sherman units
 75-99 Sherman units
 100-149 Sherman units
 150 Sherman units and over.

The frequencies then remain the same.

The following analysis of the vitamin content of diets at three income-levels shows that, although the sub-standard percentage decreased with increasing income, even in the lowest group, a large proportion of the sample secured an adequate intake; and the mean intake of each vitamin was above the standard, suggesting that by skilful education it should not be hard to eliminate the sub-standard percentages altogether.

Table III.

VITAMIN INTAKE IN DIFFERENT INCOME GROUPS (SWEDEN).

Income group:	1,500-3,000 crowns				3,000-5,000 crowns				5,000 crowns and over			
Vitamin:	A	B ₁	B ₂	C	A	B ₁	B ₂	C	A	B ₁	B ₂	C
Mean <i>a</i> intake	4,131	328	684	58	4,374	320	658	61	5,017	308	658	67
Percentage below standard <i>b</i>	43	32	39	21	32	36	47	16	12	44	47	8

a The mean values for the different income groups have been rendered comparable by standardising the populations in regard to distribution of different family types.

b The following standards were employed:

Vitamin	
A	4,000 International units
B ₁	300 International units
B ₂	650 Sherman-Bourquin units
C	50 milligrammes of ascorbic acid.

8. The fact that the above examples have been taken from countries with relatively high planes of living must not be taken to imply that scope for education does not exist also in poorer communities.

Confirmation of the thesis that nutritional education can play an important part in determining health standards was provided by an investigation into "Poverty, Nutrition and Growth" among slum children in Scotland, published in 1926.¹ Here, the factor of "maternal efficiency" was found to be more closely correlated to the nutritional condition of the children than income (per person), air-space (a measure of overcrowding) or the health of the mother. A significant correlation was found between maternal efficiency and physique of children from 1 to 4 years in Glasgow, Edinburgh and Dundee. It was supposed that the other factors, such as housing conditions, the size of the family and the health of the mother, although not directly related to the

¹ Medical Research Council: Special Report No. 101—"Poverty, Nutrition and Growth." 1926.

nutritional state of the children, probably exercised an indirect effect through their influence on the maternal efficiency factor. Maternal efficiency cannot be exactly defined; but the very close agreement found among the various investigators taking part in the study appeared to justify a statistical classification of mothers as either good and efficient with houses and children well cared for, or bad and inefficient with children and houses badly cared for. The quality of "maternal efficiency" thus determined would seem to be an element susceptible to considerable improvement by educational means.

9. An attempt has been made in Czechoslovakia to show the possibility of improving the quality of workmen's diets without increasing total expenditure on food, and taking into account, as far as possible, existing food habits and preferences.¹ The actual food consumption recorded² by ten workmen's families (each containing five members) in 1930/31 was taken as the basis. The diet was found to be adequate as regards calories, but deficient in proteins and with a low mineral and vitamin content. The changes proposed consisted chiefly of substantial increases in the consumption of milk and milk products and of fruit and vegetables; to compensate for these increases in cost and quantity, it was suggested that some more expensive cuts of meat should be replaced by cheaper ones and by fish; fat and sugar consumption should be reduced, flour to some extent replaced by potatoes, and alcohol entirely eliminated. Table IV, on the following page, shows the principal changes recommended.

The cost of the recommended diet was calculated to be about the same as that of the original. The authors of the study conclude that, "for the sum actually spent on food, the worker could procure a physiologically satisfactory diet", and that it is the task of popular health education to provide him with the knowledge required to achieve this.

10. The importance of education and its power to contribute towards the solution of the nutrition problem is naturally greater

¹ M. ČAKRTOVÁ, H. PELC, M. PODZIMKOVÁ-RIEGLOVÁ: "Essai pour l'établissement d'un type de régime alimentaire pour une famille ouvrière." *Les Travaux de l'Institut d'Hygiène de l'Etat*, No. 3. (Prague, 1936.)

² State Statistical Bureau enquiry into family living.

Table IV.

COMPARISON OF ACTUAL AND RECOMMENDED DIETS AT EQUAL COST
(CZECHOSLOVAKIA).

Food	Quantities (kg.)		Difference	
	Actual	Recommended	Kg.	%
Meat	94.90	88.66	— 6.24	— 6.6
Eggs	22.56	22.56	0.00	0.0
Fish	4.00	10.81	+ 6.81	+ 170.3
Total	121.46	122.03	+ 0.57	+ 0.5
Milk	446.50	853.11	+ 406.61	+ 91.1
Sour milk (<i>Caillebotte</i>) . . .	5.38	22.45	+ 17.07	+ 317.3
Cheese	5.38	5.85	+ 0.47	+ 8.7
Total	457.26	881.41	+ 424.15	+ 92.8
Fats	67.53	60.65	— 6.88	— 10.2
All animal foods	646.25	1,064.09	+ 417.84	+ 64.7
Cereals	20.47	25.12	+ 4.65	+ 22.7
Flour	199.70	178.51	— 21.19	— 10.6
Flour products, bread, etc. . .	338.34	338.34	0.00	0.0
Total	558.51	541.97	— 16.54	— 3.0
Cabbage.	93.16	147.64	+ 54.48	+ 58.5
Fruits (fresh and preserved) . .	63.45	117.63	+ 54.18	+ 85.4
Potatoes	320.00	353.83	+ 33.83	+ 10.6
Legumes	4.50	7.52	+ 3.02	+ 67.1
Total	481.11	626.62	+ 145.51	+ 30.2
Sugar and sweets	120.55	102.15	— 18.40	— 15.3
Spices.	36.83	34.97	— 1.86	— 5.1
Alcoholic drinks	128.81	0.00	— 128.81	— 100.0
All vegetable foods	1,325.81	1,305.71	— 20.10	— 1.5
All foods	1,972.06	2,369.80	+ 397.74	+ 20.2

in the higher-income ranges. Education can mitigate the evil among lower-income groups, but not remove it. Thus the corrected diet of the Czechoslovak worker cannot be obtained by those whose incomes do not suffice for the original diet. It was estimated that only 20% of the workers in the country, or 40% of those who were in a position to marry (the figure for Prague was judged to be higher—60 to 70%),¹ could support a family of five members at that level.

Table V.

ESTIMATED ANNUAL *per Caput* CONSUMPTION OF VARIOUS FOODS IN DIFFERENT COUNTRIES (AVERAGE 1930-1934) ^a.

	Milk and cream	Butter	Meat	Eggs	Imported citrus fruits (1934)
	Litres	Kg.	Kg.	Number	Kg.
Austria	200 ^b	2.8 ^b	—	98	4.0
Belgium	79	9.4	41	236	9.2
Czechoslovakia	155	—	33	115	2.7
Denmark	164	8.0	62	111	3.7
Finland	—	—	27	41	—
France	105	6.0	34	149	8.4
Germany	107	7.4	51	129	5.1
Italy	34	1.1	16	119	—
Netherlands	117	7.4	46	134	7.5
Norway	—	—	33	124	7.7
Poland	—	—	19	110	0.5
Roumania	—	—	—	110 ^d	0.7
Sweden	—	—	36	110	6.0
Switzerland	263	6.5	47	157	9.1
United Kingdom	95 ^c	10.0	64	172	13.1
Canada	—	13.9	65	285	—
United States	146	8.1	62	199	—
Australia	100	13.4	91	—	—
New Zealand	128	17.7	104	240	—

^a League of Nations: "The Problem of Nutrition", Vol. IV — "Statistics of Food Production, Consumption and Prices", documentation prepared by the International Institute of Agriculture (Geneva, 1936), revised. Data given in pounds in the original; converted into kilogrammes at the rate of 1 lb. = 0.4536 kg.

^b 1934. ^c 1930. ^d 1933.

II. Not only as between different income groups in one country, but also as between different countries, the scope for effective nutritional education varies. The results of educational campaigns

¹ *Op. cit.*, page 19, note.

by themselves are likely to be most satisfactory in countries where the general plane of living is fairly high. Education is, of course, of great importance in poorer countries also, but it is possible to improve the state of nutrition by educational means only within the limits set by the prevailing levels of national income and its distribution—limits which, in poor countries, may be far below those nutritionally desirable.

12. Even in countries of more or less similar planes of living, however, striking differences are to be found in the *per caput* consumption of many of the important foodstuffs (see Table V). This suggests the existence of considerable scope for improvement of national health standards through nutritional education as well as through changes in prices.

Attention has already been drawn, for instance, to the relatively low milk consumption in Great Britain compared with that of other countries on roughly similar planes of living; clearly, this country should be able to afford a higher rate of milk consumption if made fully aware of the nutritional advantages involved. In the same way, the butter consumption of some of the important dairying countries seems remarkably low; in some cases, moreover, it is accompanied by a high margarine consumption, suggesting an insufficient realisation of the superior nutritive value of butter.

C. MEASURES FOR SPREADING INFORMATION ON RATIONAL NUTRITION

13. A great deal of progress has already been made in most parts of the world in the dissemination among the public of a knowledge of the correct principles of nutrition.

14. Detailed information on the various measures adopted in different countries has already been presented by the Mixed Committee in Volume III of its interim report.¹ A number of different methods is there disclosed, corresponding to some extent to the differences in social, political and economic organisation and the particular nutritional problems of the individual countries.

¹ League of Nations: "The Problem of Nutrition", Vol. III—"Nutrition in Various Countries", 1936.

The organs responsible for the spread of nutritional information vary from country to country. In some, the State plays the main rôle; in others, voluntary or private commercial organisations are more active. The national branches of the Red Cross have prepared exhibitions, arranged lecture courses and published pamphlets in a number of countries. Women's institutes also have organised conferences and arranged for demonstrations and lectures on cooking and food values in the local branches. Co-operative organisations have published articles and books on various questions related to popular nutrition.

In addition to such educational campaigns based mainly on nutritional considerations, propaganda for the consumption of particular foodstuffs has been carried out by producers' organisations and marketing boards. In the case of "milk weeks", "egg weeks", "fish weeks", or the promotion of the consumption of fruit and vegetables, the nutritional arguments run entirely in line with the economic interests of producers. In other cases, the encouragement of consumption for commercial reasons may not receive so ready a blessing from the nutritionist experts. It is clear that an understanding among the general public of the principles of rational feeding is necessary in order to enable it to distinguish "true" from "false" nutritional propaganda.

15. Systematic education in the principles of sound feeding must be carried out within the framework of the given administrative and educational system. A primary necessity is the education in nutritional questions of public health authorities, and particularly those responsible for the administration of relief. Another essential step is the education of all mothers, more especially those who are pregnant or nursing, on the best diets for themselves and their children. Such instruction is being given in a great many countries through infant welfare centres and followed up by further advice through health visitors in the homes.

General education in the preparation and marketing of food is provided in most countries in the domestic science lessons for girls in elementary and secondary schools. The value of these lessons depends largely on the nature of the instruction in the principles of nutrition given to the teachers themselves during their period of training. Increasing attention is being devoted to this important pivot of general nutrition education. Additional

possibilities are offered by evening classes and adult schools where lectures on cookery and dietetics are normally provided. It is important that such instruction should emphasise the importance of the correct preparation as well as the correct selection of foods.

16. In addition to the instruction of the housewife of the present or future, particular importance attaches to the nutritional education of those responsible for collective feeding—in schools, in institutions, and in the army and navy. Growing attention has already been devoted to nutrition in these fields in most countries, and steps are even being taken to instruct hotel and restaurant managers in the newer knowledge of nutrition.

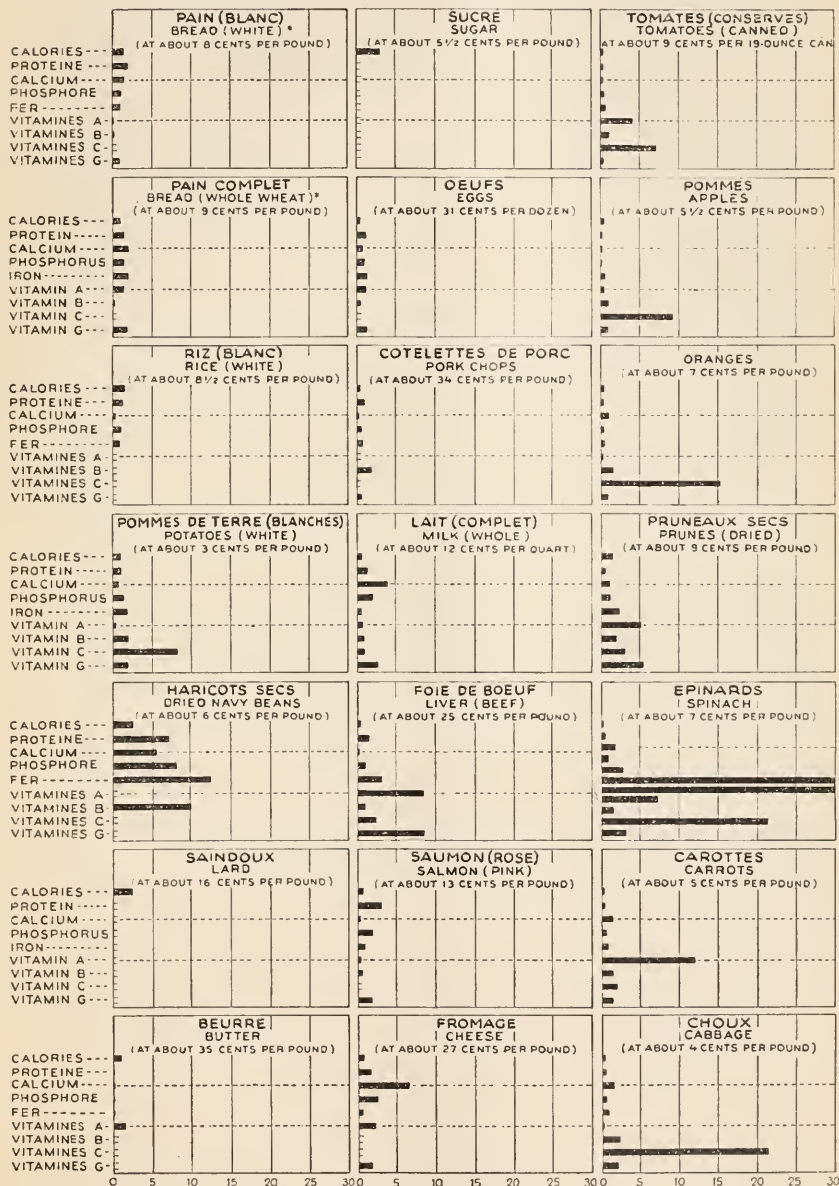
17. The main channels for spreading information to the general public have been special pamphlets, articles in the daily Press and in technical or popular periodicals, broadcast talks (which are of special use in reaching scattered populations), lantern lectures, film strips and, in some cases, the distribution free or at reduced prices of important foods such as milk, with a view to increasing their popularity and establishing the habit of their consumption.

18. Especially useful are suggestions for various diets providing all necessary nutritive elements and calculated to fit different expenditure levels. An interesting type of popular nutritional education by means of diagrams may be cited from the United States. Diagram I is part of a series of diagrams prepared by the Bureau of Home Economics of the Department of Agriculture showing roughly how 1 cent's worth of different foods compare in essential nutrients. The quantities of the various nutrients obtained for 1 cent (at July 1936 prices) are expressed in shares of the total requirements of the nutrient in question for a normal adult male (thirty such shares make up total requirements for twenty-four hours). The diagram is given merely as an example of an effective form of popular nutritional education, and not as scientifically accurate general information. It is, in fact, impossible for such a diagram to give more than a very rough and general guide, owing to the wide variations in the nutritive content of particular foods according to quality, condition of freshness, whether raw or cooked, the method of preparation, the parts actually consumed. The value of the diagram lies in its attempt to translate abstract technical nutritive requirements into concrete

Diagram I.

HOW A CENT'S WORTH OF DIFFERENT FOODS COMPARE IN ESSENTIAL NUTRIENTS.

(UNITED STATES, JULY 1936.)



quantities of familiar foods at current prices, so as to give a practical guide to housewives with restricted means in the purchase of inexpensive nutritive diets.

19. Instruction is sometimes given as to the best method of adjusting diets to the seasonal changes in relative prices and in available foods or to special emergencies, so that the maximum nutritive value for the minimum cost may always be obtained. Further, detailed information is furnished in some countries on methods of supplementing diets or reducing their cost through home garden produce and home preservation of various foods. It is essential that national nutrition authorities should adapt the general nutritional information provided to the situation in the various regions of the country—both as regards the particular foods available, the relative prices of the alternative sources of the same nutrients and the level of income of the population concerned. Where imported foods are not easily accessible, the best substitutes from a nutritional point of view should be indicated.

20. Detailed accounts of the effect on nutrition of education measures actually adopted are, unfortunately, scarce. The report by a nutritionist on three years' work in a rural community of New York State may, however, be cited by way of example.¹ An enquiry was made in 1927 among ninety-three families whose diets had been surveyed at the beginning of an educational campaign in 1924, and in almost all cases an improvement was noted. Twenty-two families reported an increased use of milk, and forty-eight that they had been using more vegetables of various kinds; thirty-eight increased the use of green vegetables and fifty-three were eating more raw vegetables. Many families living on farms had been stimulated to plant gardens and provide themselves with an abundant supply of green vegetables. Instruction had been given in the storing of green vegetables for winter use, and this practice was found to have spread considerably. Forty-eight families reported that they ate more fruit; forty-seven, more tomatoes; thirty-five, more whole-grain cereals; fifty, more whole-grain bread; and thirty-three, more eggs. At the same time, forty-one families reported a decline in meat consumption.

¹ Ruby McODELL: "Improving the Dietary Habits of a Rural Community." (Milbank Memorial Fund, New York, 1929.)

The improvement in health following these dietary changes was recognised by the families themselves.

There had been no special nutrition education of individual families, and an attempt was made to find which part of the general nutrition programme had been the most effective in bringing about the changes registered during the three years of the campaign. Forty-nine families attributed the changes to the lectures organised by the Home Bureau; thirty-two said that the influence had come through the instruction received by the children in the schools; and thirty-four attributed the main influence to the public health nurses.

An interesting feature brought out by this enquiry was the changes in the types of goods kept in the country food stores which followed the increased demand for protective foods. "Local stores, in order to supply the insistent demand for certain essential foods, were forced to add to their regular stock such things as green vegetables, fruit and whole-grain cereals, which in the past many of them had supplied erratically or not at all." As a result of a talk on the nutritive value of the cabbage, a merchant in one community sold a carload of cabbages in a week, whereas that quantity had normally lasted him one month.

21. It would be of great use for future organisers of campaigns of nutritional education if they could have more such data on the effects of past efforts, and particularly on the methods of education which had been found to yield the best results.

Chapter 7.

EVIDENCE OF MALNUTRITION IN CERTAIN COUNTRIES

1. In previous chapters of this report, two conflicting sets of tendencies have been revealed, one of which (the general rise in national incomes, and particularly real labour incomes, the spread of knowledge regarding correct principles of nutrition and scientific progress in agriculture) has made for a marked improvement in nutrition, while the other (the persistence, in many parts, of poverty, ignorance and factors artificially raising food prices) has prevented the improvement from going so far as could be wished. The net result of these conflicting tendencies in the different countries is the level of nutrition as it exists to-day. It would be desirable to give at this point a description of the prevailing level of nutrition in different parts of the world, in order to illustrate the real scope and significance of the present problem of malnutrition.

2. Unfortunately, with the information at present available, it is impossible to do so. Statistics of the average national consumption of various foods, based on figures of production and trade, would be misleading for this purpose, as they conceal the differences—which the preceding chapters have shown to be wide—between the food consumption of the various income and social groups. A great many studies of the food-consumption habits and nutritional standards of particular groups of individuals and families have been made, but the number of individuals and families included in the sample is generally so small, and drawn from so restricted an area or population group, that it would be extremely dangerous to generalise on the results of these studies. Moreover, different norms have been used by different investigators in assessing the nutritional status of the population groups they have examined, so that any international comparison is, at the present time, out of the question, and even national studies must be treated with extreme caution.

The paucity of the information available is to be deplored, as it is obvious that an accurate knowledge of the facts must form the basis of a sound nutrition policy. At the present stage of the movement towards better nutrition, the collection of information on food consumption habits and nutritional standards is a fundamental and pressing need. Within the past year, two groups of experts, meeting under the auspices of the League of Nations, have made important contributions in this field. One group, which met at Geneva in December 1936 to consider methods of assessing the state of nutrition of children and young people, decided to recommend three types of enquiries applicable to different requirements. Discussion of the question of the methods appropriate to general surveys of the food-consumption habits of a nation as a whole occupied a considerable part of the time of the representatives of national Nutrition Committees who met at Geneva in February 1937. It is to be hoped that use will be made of the results of these various discussions by public and private authorities and that the information at present available regarding food-consumption habits and nutritional status will become progressively more complete and reliable.

3. For the present, it is therefore necessary to limit this exposition to a few examples of the nutritional situation, drawn from different parts of the world. It is necessary to emphasise that the paragraphs which follow do not purport to give a comprehensive picture, but merely to show that the problem of malnutrition is a real one and that it exists in countries of the most diverse social structure and stage of economic development.

United States of America and Western Europe.

4. In the United States, Sweden and the United Kingdom, attempts have been made during the past two years to study and analyse in detail the food-consumption habits of large and representative groups of the population. As it happens, these are all countries where the general plane of living is relatively high.¹

¹ It is hardly necessary to substantiate this statement, but substantiation can be found in the figures of *per caput* consumption of different foods published in League of Nations: "The Problem of Nutrition," Vol. IV—"Statistics of Food Production, Consumption and Prices". (Geneva, 1936.)

5. Records of food consumption of a very large number of families have recently been collected by the United States Bureau of Labor Statistics for the purpose of revising cost of food indices. A preliminary analysis of the content, nutritional adequacy and economy of a selection of these diets has been made by the Bureau of Home Economics. When the analysis of the material collected by the Bureau of Labor Statistics is completed and when the results of the study of consumer purchases (co-operatively undertaken by the Bureau of Home Economics, Bureau of Labor Statistics, National Resources Committee and Works Progress Administration) are available, it will be possible to assess with a high degree of accuracy the adequacy of diets in the United States as a whole. The preliminary material already published throws, however, a considerable amount of light on the food habits and nutritional state of the population groups to which it relates.

Records relating to the food expenditure (at various periods from 1934 to 1936) of 2,746 families of wage-earners and clerical workers living in four different sections¹ of the country showed the following percentage distribution of food expenditure per person per year:²

Table I.

DISTRIBUTION OF FAMILIES ACCORDING TO ANNUAL FOOD EXPENDITURE PER HEAD
(UNITED STATES).

	Food expenditure per person per year	Percentage distribution of the 2,746 families
1.	Under \$32	0
2.	\$32-\$65	2
3.	\$65-\$97	14
4.	\$97-\$129	28
5.	\$129-\$161	25
6.	\$161-\$193	15
7.	\$193-\$226	8
8.	\$226-\$258	4
9.	\$258-\$290	2
10.	\$290 and over	2

100

¹ New England, Middle Atlantic, East South Central (white families and negro families) and Pacific.

² Adjusted to March-May 1935 price-levels. See Hazel K. STIEBELING: "Food Consumption of Urban and Village Families at Different Levels of Food Expenditure" in *Journal of Home Economics*, January 1937.

Table II.

DISTRIBUTION OF 897 DIETARY RECORDS ACCORDING TO GRADE OF DIET BY LEVEL OF EXPENSE FOR FOOD, REGION AND COLOUR OF FAMILY (UNITED STATES).

Level of expense for food, region, and colour of family	Number of records	Percentage of diets classified as:		
		Grade A	Grade B	Grade C
1. Families spending \$1.33 to \$1.99 per food cost unit ^a per week for food (group 3 of Table I):				
North Atlantic, white	117	2	37	61
Pacific, white.	21	10	33	57
East South Central { white	114	6	35	59
{ negro	83	4	31	65
Total or average	335	4	35	61
2. Families spending \$2.67 to \$3.32 per head cost unit per week for food (group 5 of Table I):				
North Atlantic, white	253	27	65	8
Pacific, white.	132	39	57	4
East South Central { white	53	55	43	2
{ negro	18	55	28	17
Total or average	456	35	59	6
3. Families spending \$4.00 to \$4.66 per food cost unit per week for food (group 7 of Table I):				
North Atlantic, white	69	77	19	4
Pacific, white.	37	78	22	0
Total or average	106	77	20	3
4. Groups 1, 2 and 3 above combined:				
North Atlantic, white	439	28	50	22
Pacific, white.	190	44	47	9
East South Central { white	167	22	38	40
{ negro	101	13	31	57
Total or average { white	796	31	47	22
{ negro	101	13	31	57
All families covered	897	29	45	26

^a See footnote b page 253. Adjusted to 1935 retail food prices.

One-sixth of the families included in this sample were spending less than \$97 per head per year for food. Of this sixth of the population covered, it is remarked that "families spending at these low levels are very likely to have diets deficient in one or more nutritive factors; in fact, about two-thirds of those spending between \$65 and \$97 *per capita* per year for food had diets which failed to meet average 'minimum requirements' in one or more respects".¹ Nearly 30% spent between \$97 and \$129 per head per year for food; "the diets of most of these families tend to meet average requirements, but have an uncertain margin for safety". The families spending more than \$129 per head per year could, with careful selection and preparation of food, obtain a fully adequate diet; but it was found that only half of the group spending from \$193 to \$226 per head "had diets providing a generous margin of safety in all nutritional essentials".

6. The nutritive content of the diets of 897 families falling in level-of-food-expense groups 3, 5 and 7 of Table I, was analysed. The distribution of the dietary records according to grade of diet, by level of expense for food, region and colour of family is shown in Table II on the preceding page.²

The last line of this table shows that, of the 897 families, 29% had grade A diets, 45% grade B diets and 26% grade C diets.³ In other words, nearly three-quarters of the observed population had diets which are regarded as falling short of the optimum: their intake of one or more essential nutrients fell below the standard considered necessary for health and efficiency or failed to provide the requisite "margin of safety".

Nearly 90% of the observed negro population had diets classified as B or C; for the white population, the percentage was almost 70. A higher proportion of the population of the Pacific region obtained A diets than of the North Atlantic or East South Central regions. This is partly due to the fact that more of the observed families of the Pacific region fell in the higher level-of-expense-for-food

¹ *Ibid.*, page 10.

² From an unpublished study by Hazel K. STIEBELING: "Diets of Families of Wage-earners and Low-salaried Clerical Workers living in Industrial Communities in Three Regions of the United States, 1934-1936." (Mimeographed, Washington, February 1937.) Reproduced by courtesy of the author.

³ For the precise definition of the nutritive contents of the three grades of diet, see first footnote on page 281.

groups; it may also be due in part to lower food prices. It will be observed that within any given region and level-of-expense-for-food group there is a wide distribution in the character of the diet obtained by different families.

7. Analyses of the material collected by the Bureau of Labor Statistics on food-consumption habits of non-urban families have not yet been published. The Bureau of Home Economics has, however, recently analysed the results of a number of studies made by different investigators between 1917 and 1932.¹ The *per caput* money value of the food consumed ² by the 544 families covered in the different studies was adjusted to 1935 price-levels to render them roughly comparable. The percentage distribution of the records according to level of money value of food per head and type of diet obtained is shown below:

Table III.

DISTRIBUTION OF FARM FAMILY DIETS ACCORDING TO GRADE OF DIET, BY VALUE OF FOOD (UNITED STATES).

	Annual money value of food per head	Percentage of records	Percentage distribution by grade of diet		
			A	B	C
1. Under \$32		2	0	9	91
2. \$32-\$65		17	4	50	46
3. \$65-\$97		34	26	56	18
4. \$97-\$129		30	55	41	4
5. \$129-\$161		12	74	26	0
6. \$161-\$193		4	90	10	0
7. \$193-\$226		1	87	13	0

On account of the methods used, the results are, of course, less reliable than those quoted in the previous paragraph for industrial workers. They suggest, however, that the incidence of malnutrition is at least as great in rural as in urban communities; in both cases, an appreciable fraction of the population is, for one reason or another, failing to secure a diet deemed adequate for health and efficiency.

8. Assessments of the nutritional status of children in the United States made at various periods in recent decades have

¹ U.S. Department of Agriculture: Agricultural Outlook Charts, 1937—"Farm Family Living and Summaries." (Washington, November 1936.)

² Food produced and consumed on the farm was valued at *wholesale* prices prevailing in the nearest market.

revealed a considerable degree of malnutrition. It must, however, be emphasised that the standards used are not uniform in the different studies, and in some cases the classification is largely based upon the personal appreciation of the investigator. The examples which follow are quoted merely with a view to demonstrating the existence of malnutrition, and cannot be taken as necessarily reflecting accurately its extent.

In a summary¹ of thirteen investigations, each involving thousands of children, carried out between 1906 and 1924, the average percentage suffering from malnutrition on the basis of clinical examination was judged to be 22.3. In seventeen investigations carried out during 1918-1924, weight in relation to height was used as a criterion of nutritional status, and 32.7% were judged to be malnourished. In a clinical examination of several hundred New York school-children made in 1933, the nutrition of more than a third of the children was rated as "poor" or "very poor".² Investigators have found a high prevalence of rickets among children; writing in 1921, HESS and UNGER said that "fully three-fourths of the infants in the great cities, such as New York, show rachitic signs of some degree".³

Of the deficiency diseases attacking adults, pellagra is to be found in the United States. Nearly 7,000 deaths from this disease were recorded in 1928, or 6.1 per 100,000 inhabitants. By 1933, the number of deaths had fallen to less than 4,000, or 3.1 per 100,000 inhabitants. Pellagra is practically confined to the Southern States, where maize is the staple cereal; in 1930, the pellagra death rate in North Carolina, South Carolina, Georgia, Alabama, Mississippi and Arkansas was 29.4 per 100,000 inhabitants.

9. An analysis has recently been made of the nutritional content and adequacy of the diets of Swedish wage-earners, low-salaried employees and members of the "middle class".⁴ The original data on food consumption were obtained in connection with the

¹ ROBERTS: "Nutrition Work with Children" (1927).

² KISER and STIX: "Nutrition and the Depression" in *Quarterly Bulletin of the Milbank Memorial Fund*, October 1933.

³ See BURNET and AYKROYD: "Nutrition and Public Health", in *Quarterly Bulletin of the Health Organisation of the League of Nations*, June 1935.

⁴ Ernst ABRAMSON: "Preliminary Report on the Composition of Swedish Diets." Stockholm, 1937 (mimeographed).

Social Board's investigation of living conditions and household habits made in 1933; they relate to the year November 1932-November 1933. Of the household records thus made available, 1,245 were analysed on behalf of the Swedish National Nutrition Committee. The average calorie value of the diets was found to exceed 3,500 calories; their average protein content was about 100 grammes, the fat content 140 grammes and the carbohydrate content 425 grammes. Average calcium content was over 1 gramme per day, phosphorus content around 1.85 grammes and iron content 17 milligrammes. There were, however, wide differences in the consumption of different income and family-type groups and considerable deviations in the value of the individual diets within each homogeneous group. A detailed analysis was made of the material to determine how large a proportion of the various population groups failed to secure adequate intake of various nutrients. The results are shown below:

Table IV.

PERCENTAGE OF DIETARIES BELOW STANDARD IN RESPECT
TO THE SPECIFIED NUTRIENTS (SWEDEN).

	Protein %	Calories %	Calcium %	Phosphorus %	Iron %
All families	3.1	15.4	2.1	4.6	23.0
Workers.	2.9	12.7	2.2	2.9	22.1
Salaried employees	2.9	16.1	2.7	4.4	23.3
Middle class	3.4	17.1	2.0	4.0	24.8
Middle part of Sweden (Svealand) .	2.4	13.3	1.9	3.4	22.1
Southern part of Sweden (Norra Götaland)	2.4	15.4	1.5	2.7	27.1
Southernmost part of Sweden (Södra Götaland)	4.3	17.1	5.2	4.7	18.9
Northern part of Sweden (Norrland)	3.3	14.9	1.0	2.7	23.9

The standards of adequacy adopted are 3,000 calories per consumption unit per day, 70 grammes of protein, 0.68 grammes of calcium, 1.32 grammes of phosphorus and 15 milligrammes of iron. It will be observed that 15% of the observed population failed to secure this standard of calorie intake and nearly a quarter of the population failed to secure the " norm " of iron intake. Further calculations showed that 27% of all the dietaries were deficient in vitamin A (4,000 International units was taken as standard),

36% were deficient in vitamin B₁ (300 International units) and as many as 43% were deficient in vitamin B₂ (650 Sherman-Bourquin units), while 14% were deficient in vitamin C (50 milligrammes of ascorbic acid taken as standard).

10. During the years 1929-1931, an extensive social-hygienic investigation was carried out in certain parts of Sweden in an attempt to discover the relationship between diet and the high incidence of certain diseases (gastric and intestinal disturbances, anæmia, etc.) among the agricultural population of the coast district of the north of Sweden.¹ Their isolation and difficulties in disposing of their products render the diet of this population monotonous and lacto-cereal, with herring used largely as a condiment. Vegetables and fruit are scarcely eaten; wood-berries are available, but they are eaten only to a limited extent and hardly ever preserved for winter use. The investigation showed that there was an intimate connection between the one-sided structure of the diet and the diseases referred to, and that the incidence of these diseases was very much less among the forest workers of the same region, whose diet includes pork, reindeer meat, sausage, game and fish, as well as milk and potatoes.

11. In Norway, periodic measurements have been made of the weight and height of school-children of different social groups. The following table shows the figures concerning children 14 years old at different periods:

Table V.

HEIGHT AND WEIGHT OF SCHOOL-CHILDREN AT STATE
AND PRIVATE SCHOOLS (NORWAY).

	State schools				Private schools			
	Boys		Girls		Boys		Girls	
	Height Cm.	Weight Kg.	Height Cm.	Weight Kg.	Height Cm.	Weight Kg.	Height Cm.	Weight Kg.
1920 . .	148.2	38.5	150.6	41.8	153.5	42.4	154.9	44.9
1925 . .	150.5	40.0	152.4	42.4	155.9	43.8	155.9	45.9
1930 . .	153.1	42.6	154.9	45.5	157.4	45.5	158.5	48.2
1935 . .	155.0	43.6	157.3	47.3	162.7	50.0	161.2	50.1

¹ Martin ODIN: "Certain Kinds of Diet in connection with Diseases among Various Groups of Population in Various Parts of Sweden", *Acta Medica Scandinavica* (Upsala, 1934).

Two points in this table are of great interest. One is the steady increase in the height and weight of school-children in Norway in 1935: this is unquestionably connected with the improvement in food-consumption habits to which reference has been made in Part III, Chapter I. The second point of interest is the considerable difference which exists between the heights and weights of children of the same age but of different income groups. This may also be mainly attributed to the difference in their food consumption.

12. For the United Kingdom, the most comprehensive survey of the state of nutrition available is that made by Sir John Boyd ORR and his colleagues in 1936.¹ The data used were collected by the Market Supply Committee² and have been accepted by the Advisory Committee on Nutrition of the Ministry of Health as substantially correct. They were based upon 1,152 dietary records collected by various investigators between 1932 and 1935. "They include an undue proportion of families in the industrial north, of families with small incomes and relatively large numbers of dependants. Moreover, they were not distributed seasonally throughout the year, but tended to be concentrated in the spring and early summer months . . . the actual quantities and values of the different items in the family dietary would no doubt be somewhat altered if a collection of family budgets thoroughly representative of the whole country were available."³

A series of estimates was made of the distribution of the whole population according to income and food expenditure per head; and these estimates were used in conjunction with the dietary records of the observed families falling within the different level-of-food-expenditure groups to form the basis of a generalised picture of the nutritional state of the population as a whole. The conclusions reached in this way were that the average diet of the 10% of the population with lowest incomes was "inadequate for perfect health in all the constituents considered";⁴ that the diet of the next

¹ J. B. ORR: "Food, Health and Income." (London, 1936.)

² Published in the *Journal of Proceedings of the Agricultural Economics Society*.

³ J. B. ORR: "Food, Health and Income", pages 61-62.

⁴ Standards adopted for a "moderately active man" were 3,000 calories, 67 grammes of protein, 0.68 gramme of calcium, 1.2 grammes of phosphorus. 15 milligrammes of iron, 5,600 International units (= about 4,000 Sherman units) of vitamin A and 1,000 International units (= about 100 Sherman units) of vitamin C per day.

poorest 20% was "adequate only in total proteins and total fat"; that the next 20% had a diet "adequate in energy value, protein and fat, but below standard in minerals and vitamins"; that the next 20% were "adequate in iron, phosphorus and vitamins, but probably below standard in calcium"; that the next 20% "had an ample margin of safety in everything with the possible exception of calcium"; and that in the 10% of the population with highest incomes, the standard requirements were exceeded in every case.

13. The same study records the height of males of the same age in different social groups, and considerable differences are disclosed. "These differences in height are in accordance with what would be expected from an examination of the diets in common use in these classes. In the lower-income groups, the diet is relatively deficient in the constituents" required for growth. Too high a proportion of the diet consists of carbohydrate rich foods, which contain very little bone- and flesh-forming material".¹ Experiments carried out in Scotland in 1927 with a view to determining the effect of supplementing the diet of school-children with milk showed that the rate of growth of those receiving additional milk was about 20% greater than in those not receiving additional milk. "The increased rate of growth was accompanied by a noticeable improvement in health and vigour".² With regard to the incidence of diseases known to be connected with diet, it is stated that rickets has "markedly decreased in recent years". On the other hand, "about 80% of the deciduous teeth of British children are imperfectly developed. Since this defect may be established before birth, it may in part be due to dietary deficiency in pregnancy. But the fact that the incisors, which are in the most advanced state of development at birth, are usually better calcified than the later-developed molars suggests that the dietary deficiency may be even greater in early childhood than before birth".³

The Advisory Committee on Nutrition for Great Britain wrote in its first report, published in the spring of 1937:

"Although much has been achieved, much still remains to be done before the general health and physique of the population reach the optimum level. It must

¹ *Op. cit.*, page 41.

² *Op. cit.*, pages 47-48.

³ *Op. cit.*, page 42.

not, for example, be overlooked that, in 1935, tuberculosis was still responsible for 32,903 deaths (England, Scotland and Wales), 6.1% of the total mortality, or that the mortality rate from all causes in children aged 1 to 4 years, favourable as is its trend, is distinctly higher than that of certain other countries, notably Norway, Sweden and the Netherlands. Moreover, the numerous milk feeding experiments which have been carried out demonstrate how physique in childhood might be improved. There is thus ample room for further progress, and we believe that the improvements in diet referred to will play an important part in attaining this end."

Union of South Africa and Australia.

14. In South Africa, a recent Government report¹ contained the following comments on the diets of European families in certain urban areas:

"It is unlikely that many cases go short of calories. The proportions of protein, fat and carbohydrate are within what are generally considered to be normal limits. . . . The intake of minerals gives no cause for alarm, except in the case of calcium in the lower-income groups. . . . Values of the order of 0.5 gramme per day show a real poverty of this element that cannot be satisfactory, especially as the average family contains several children who have a special need of calcium. For pregnant and lactating women, this amount is grossly inadequate. A monotonous diet, such as that of poorer groups, is very liable to serious deficiencies: deficiencies of a mineral constituent, a vitamin or an amino-acid, or, more probably, a subtle combination of several deficiencies, no one of which would be very serious by itself; deficiencies which produce a subnormal condition rather than a recognisable pathological state; deficiencies which are not revealed by an analysis of the diet into its constituents or by any other theoretical consideration of the items in the diet. . . .

"The position regarding the consumption of milk is highly unsatisfactory. It is to be deplored that there should be such a falling-off of money spent on milk from the richer to the poorer classes. More than half the families in the poorer groups never see milk—families containing several children who have a special need of milk. It is very unlikely that many of these families are escaping from serious nutrition deficiencies."

15. An Advisory Council on Nutrition was established in Australia in February 1936 and presented its first report² in September of that year. On the general state of nutrition of the

¹ "Report on the Enquiry into the Expenditure of European Families in Certain Urban Areas, 1936." Union of South Africa, Office of Census and Statistics. Pretoria, 1937.

² League of Nations Mixed Committee on the Problem of Nutrition, document 59, September 4th, 1936. Reply to C.L.202.1935.

population, the Council reported that "no evidence is available . . . of any general or gross under-nourishment of the population. To this general statement, however, certain exceptions must be made. It is known that in some of the capital cities rickets exists amongst the children. . . . Evidence of an indefinite nature was placed before your Council that 'pre-scorbutic' conditions are to be found amongst the children of the remote interior districts of the continent, where vital food elements are not available. It is known that in certain localities, which are restricted in area and few in number, goitre occurs as an endemic disease... Some evidence of an inconclusive character was before your Council pointing to the possibility of some calcium deficiency in the diet of the people of the Brisbane area; and some phosphorus (or calcium) deficiency in the diet of the residents of Western Queensland (and perhaps also of other interior districts of Australia)".

In regard to the consumption of certain individual articles of food, the Council reported: "It is undeniable that the people of Australia are not consuming as much *milk* as would be physiologically beneficial. This applies with especial force in the case of infants, children, pregnant women and nursing mothers." *Meat* consumption was reported to be high. Attention was drawn to a disquieting feature—"a deeply-rooted prejudice in Australia against the eating of internal organs—brains, heart, liver, kidney and sweetbreads. These contain special food factors which render them specially valuable as foods". A similar prejudice against all cheaper cuts of meat was reported and deplored.

In regard to *fruit and vegetables*, the Council stated that "the present cost very gravely restricts their consumption as food over a considerable portion of the Commonwealth". In the case of *bread*, the Council expressed its deep concern at the "low level of quality reached by much of the bread made in Australia", and its opinion that "wheat flour is not now being so used that the maximum food value or even the maximum æsthetic value is being obtained from it". The Council advised that "the use of lightly milled cereals and of potatoes should be increased. An extension in the use of the latter should be made at the expense of sugar as a source of carbohydrates". The Council declared that the consumption both of fish and eggs could and should be much extended.

Some evidence regarding nutritional diseases in Melbourne may be derived from a report on an examination of 1,009 pre-school children in 1936. The Emerson height-weight standard was taken as an approximate guide to the state of nutrition. In 1934 and 1935, 26.4 and 25 % respectively of all the children showed evidence of malnutrition in that they were 7 % or more below the Emerson standard. It was stated in the report on the examination: "Many of the children are definitely stunted and, although the weight is enough for their small height, they are obviously undersized. One is justified in believing that, with better diet and hygienic conditions, more light, air and good food, the average of these Australian children would be higher.

"The lack of balance, in the diet, due perhaps to the practice of appeasing the hunger of growing children with excess of carbohydrate, is another disquieting feature. The pale, puffy, even slightly overweight child, with continual catarrh, colds and chronic bronchitis, came to be such a familiar type that it could be recognised as it came through the door.

"The increasing evidence of malnutrition with age is very marked. At 2 years of age, 16 % were under weight, at 3 years 18 %, at 4 years 23 %, and at 5 years 43 % were malnourished."

The incidence of dental caries at different ages among the pre-school children examined was as follows:

Table VI.

CARIES AT DIFFERENT AGES AMONG PRE-SCHOOL CHILDREN
(MELBOURNE, AUSTRALIA).

Age	Percentage of children with carious teeth
2-3 years	14
3-4 years	33
4-5 years	55
5-6 years	76

"In regard to rickets, 3 % of the children presented definite cases, and another 15 % showed such signs as knock-knees, bossy foreheads, depressed or malformed chests, prominent abdomens.

"Many children, by the pallor of their skins and mucous membranes, appeared to be anæmic. Of eighty children who were

regarded as definitely anæmic, thirty were also under weight and regarded as malnourished. Seven were over weight, but not therefore well nourished, as in many of these cases one found a protein deficiency and carbohydrate excess in the diet."

Central and Eastern Europe.

16. The examples of the preceding paragraphs, drawn as they are from countries where the general plane of living is high, leave no possible doubt that, even in the most advanced countries of Western civilisation, a serious problem of malnutrition exists. In countries with lower general income-levels, it is likely that the evil is even more widespread. In the agricultural regions of Central and Eastern Europe, where farming is largely on a subsistence basis, the peasant eats what he cultivates himself; and very often he cultivates mainly one or two cereals and/or potatoes and cabbage or beans and pays little or no attention to those additional cultures which would supplement his intake of minerals and vitamins. Frequently, the consumption of meat in peasant households is restricted to one pig per year, which is slaughtered at Christmas. Natural conditions sometimes set rigid limits to the crops which can be produced, but in some cases these conditions are favourable to production of a type which would relieve the monotony of the diet and supply essential nutrients at present lacking. The low level of agricultural technique (connected in part with the lack of capital) and, in some cases, the excessive parcellation of the land and high or increasing population density are important factors militating against better nutrition. Another factor worthy of mention is the disproportion which frequently exists between the prices which the peasant receives for the products he sells and the price he must pay for his modest purchases of industrial goods.

17. Very little exact information is available regarding the nutritional status of the population of Central and Eastern Europe, and conditions vary so much from one region to another that it would be extremely dangerous to generalise on the basis of fragmentary data. There is, however, enough information to make it clear that, paradoxical though it appears, a serious problem of malnutrition (in some cases, perhaps, even under-nutrition) exists among a section of the population of Central and

Eastern Europe engaged in food production. A few examples will be sufficient to establish this fact. Thus, in the so-called "passive" regions of Yugoslavia (which include $2\frac{1}{2}$ million people), the land is too unfertile to feed the large number of people on it;¹ the yield of wheat and maize is low, the breed of live-stock is poor and the relatively small quantities of fruit grown are generally sold to provide the cash required for essential industrial goods and taxes. The exact nutritional status of the inhabitants of these regions has not been analysed, but the results of recruiting are stated to indicate the inadequacy of nutrition; tuberculosis is widespread.

18. A detailed analysis was made of the diets of twenty-two peasant families living in Osoi, a village in Moldavia (Roumania), during the winter and spring of 1933/34 and 1934/35. These families represented different economic levels, but seventeen of the twenty-two contained members who suffered from pellagra in 1933, and, in three others, cases had been recorded during 1931/32.²

The following table gives the average daily consumption per consumption unit ³ of various foods during five different periods of the year. The periods are as follows:

Period

1. Pre-Christmas fast (November 30th-December 24th, 1933).
2. Post-Christmas time (December 25th, 1933-February 18th, 1934).
3. Lent (February 19th-March 28th, 1934).
4. Post-Easter time (April 8th-June 8th, 1934).
5. St. Peter's fast (June 4th-June 21st, 1934).

Diet varied considerably as between fasting and non-fasting periods. During the seven weeks' Lenten fast and the six weeks' pre-Christmas fast no animal food is allowed, and during Passion Week vegetable fats, such as olive oil, are also forbidden. Children under 10 do not normally observe these fasts, and, in fact, usually consume more milk, butter and eggs during these periods, since there is more available for them. The diet during periods 4 and 5 was supplemented by the addition of whole wheat (*cf.* greatly increased consumption of brown bread).

¹ See League of Nations: "The Problem of Nutrition", Vol. III. (Geneva, 1936.)

² W. AYKROYD, I. ALEXA and J. NITZULESCU "Study of the Alimentation of Peasants in the Pellagra Area of Moldavia (Roumania)", *Archives roumaines d. pathologie expérimentale et de microbiologie*. (Paris, December 1935.)

³ See footnote, page 243, scale *k*.

Table VII.

PRINCIPAL FOODS CONSUMED AT FIVE DIFFERENT PERIODS BY TWENTY-TWO FAMILIES IN Osoî (MOLDAVIA, ROUMANIA).

(In grammes per International consumption unit ^a per day.)

	Period 1	Period 2	Period 3	Period 4	Period 5
Whole yellow maize	762	645	773	276	350
Refined wheat flour	40	79	53.5	60	8.9
Bread (brown)	43	39	25.2	745	760
Bread (white)	9	7.8	6.9	4	5
Rice	16	10	5.5	6.1	6
Milk (whole)	11	16	19.2	179	217
Buttermilk and sour skimmed milk	5.1	9.9	7.5	52.4	63.2
Cream and butter	—	1.3	0.5	5.1	8.9
Cheese	0.7	15	1	20.4	30.8
Eggs	0.5	7.9	6.6	40	12.7
Meat (all kinds)	34.1	93.9	13.4	68.9	57.2
Beans (dry)	86	25	86.9	19	15
Beans (string)	—	—	—	0.27	16.6
Potatoes and root vegetables .	59	21.3	54.2	13.9	0.22
Green vegetables, <i>Sauerkraut</i> , pickles	78.5	71	112.2	33.5	32.1
Onions	12	9.6	17.3	2.9	0.02
Dried fruits	21	3.7	5.7	0.14	—
Fresh fruits	0.8	0.3	0.1	27.4	220
Lard and bacon	0.03	15	1.7	14.8	2.8
Olive oil	10	0.4	8.4	4.6	3.6
Sugar	1.6	3.4	3.0	9.7	1.3

^a See footnote, page 241, scale *k*.

The nutritional content of these diets is shown in the following table:

Table VIII.

ANALYSIS OF DIETS OF TWENTY-TWO PEASANT FAMILIES IN Osoî (ROUMANIA).

Average daily intake of:	Period 1	Period 2	Period 3	Period 4	Period 5
Calories per International consumption unit	3,941	3,657	3,886	3,995	4,090
Proteins per Hawley consumption unit ^a . . . grammes	86	83.6	85.65	102.4	105

^a Hawley scale for protein and mineral requirements:

Child under 6	0.8
Child 6-9	1.0
Girl 10-12	1.2
Girl 13-14	1.3
Boy 10-14	1.3
Girl 15-17	1.2
Youth 15-17	1.0
Woman 18-60	0.8
Man 18-60	1.0

Table VIII (*continued*)

Average daily intake of:	Period 1	Period 2	Period 3	Period 4	Period 5
Fats per International consumption unit grammes	45	63.8	49.5	69	58.1
Carbohydrates grammes	726	613.6	717.2	698.2	739
Calcium per Hawley consumption unit grammes	0.28	0.34	0.28	1.03	1.195
Phosphates grammes	2.24	1.93	2.18	2.06	2.27
Iron grammes	0.025	0.0197	0.024	0.0193	0.0215
Percentage of calories from maize	74.27	68.8	74.9	25.36	30.2
Percentage of proteins from maize	67.91	60.77	67.45	20.23	24.95
Percentage of animal proteins	4.03	20.18	3.02	19	18

From this table, it appears that the calorie content of the diets was adequate in all seasons; the protein intake was sufficient in quantity but inadequate in quality, particularly during fasting periods; fat intake was low and carbohydrate intake very high; calcium consumption was well below standard (0.68 grammes, according to Sherman), except during the period where home-produced milk and cheese were available and where supplementary wheat was administered; the phosphate and iron contents were adequate in all periods—the latter mainly owing to the consumption of beans. As regards vitamins, the main deficiency is in vitamin B₂. (The lack of vitamin D in the diet appears to be compensated by the outdoor life.) The diet of periods 1-3 is said to be “probably a typical pellagra-producing diet, resembling in its general composition the diets consumed throughout the pellagrous districts of Roumania and other pellagrous districts in Eastern and Northern Europe, Southern Russia and Egypt. The most striking feature is its high percentage of maize. In general, the habitual diet of the families studied is deficient in vitamin B₂ and calcium and in protein of high biological value. Intake of protective foods—*e.g.*, milk and green vegetables—is small”.¹

A study² recently made of the consumption during one year of fifty families of the village of Dragus, in Transylvania (Roumania),

¹ *Op. cit.*, page 422.

² D. C. GEORGESCO, of the Central Institute of Statistics: “Considérations sur l'alimentation paysanne en Roumanie” in “Mélanges”; D. GUSTI: *Archives pour la Science et la Réforme Sociales* (Bucharest, 1936).

estimated the average daily consumption per "consumption unit" at 4,344 calories, 121 grammes of protein, 82 grammes of fat and 781 grammes of carbohydrate. These figures are not based upon direct observation, but are estimated on the basis of amounts of foods produced, fed to animals, purchased, etc. It was found upon analysis that 83% of the total calorie consumption was derived from foods of vegetable origin (43% from maize and 32% from wheat and rye) and only 17% from meat, milk, butter, eggs and other foods of animal origin. Of the proteins, 78% were found to be of vegetable origin and 22% of animal origin. The consumption of milk is stated to be relatively high in the village in comparison with other regions, but the author concludes that "it is beyond dispute that the nutrition of the peasant population studied is qualitatively inadequate from the point of view of protein content and quantitatively inadequate from the point of view of fat content". A similar study carried out in the village of Cornova, in Bessarabia, showed that consumption of animal protein was only 17% of the total (97 grammes per head per day).

Pellagra is found in the parts of Roumania where maize is the chief article of diet. According to AYKROYD,¹ some 5 to 6% of the population of the villages of Moldavia which he visited in 1933 suffer from pellagra every spring. Figures supplied by the Roumanian public health authorities show the following mortality from pellagra during the years 1930-1933:

Table IX.

DEATH RATE FROM PELLAGRA IN ROUMANIA.

Year	Deaths from pellagra	Death rate per 100,000 inhabitants
1930	2,087	11.7
1931	2,075	11.4
1932	1,964	10.7
1933	2,800	15.0

In the opinion of BURNET and AYKROYD, "these figures certainly represent an understatement, for many deaths actually due to pellagra which first invalidated the patient are ascribed to terminal causes".

¹ See BURNET and AYKROYD: *op. cit.*

19. It is stated¹ regarding the nutritional position in Hungary that "the diet of the Hungarian agricultural worker is quantitatively and qualitatively far below requirements for work". The staple food is bread, flour dishes, dried beets and beans, potatoes, cabbage, bacon, very rarely beef or mutton and occasionally pork for those who can afford it. "There is hardly any consumption of milk, eggs, poultry, butter, green vegetables, fruit (except water-melons) and sugar". The diet as a whole is characterised as "rich in vegetable proteins and carbohydrates, but poor in animal proteins, in vitamins A, C and D and in minerals". The only difference in the diet of the very poor and the better-off peasants is said to be the use of more fat and meat by the better-off. Rickets, dental caries and latent hypovitaminosis are stated to be prevalent; and the excessive consumption of carbohydrates is said to lead frequently to gastro-enteritic disturbances. A study of the diet of day-labourers in Budapest made by the same author in 1934 resulted in the conclusion that it was similar to that of the agricultural labourers and "equally inadequate".

20. Observations made in certain rural areas of Czechoslovakia have revealed striking deficiencies in the diet. Thus, in Sub-Carpathian Ruthenia, maize is the "traditional and almost exclusive diet of the population".² A study made by the State Institute of Public Health of nutrition in certain agricultural regions of Slovakia found that, though milk was in common and abundant use, its quality "did not satisfy even minimal requirements"; apart from milk, cereals were found to be the main constituent of the diet. Fruit is not eaten to any great extent, and the only vegetable of importance, apart from potatoes, is cabbage. Of the three districts examined in detail, it was found that in Drava the diet was "far from satisfactory from a qualitative point of view"; in Liptov, the diet was "one-sided"; and it was only in Turiec (where more meat, fruit and vegetables were eaten) that the diet was found to be adequate.

21. In parts of Poland, particularly in the east, the food of the peasantry consists almost exclusively of rye and potatoes. The

¹ By Dr. L. SCHEFF-DABIS, Assistant Director of the Metropolitan Health Laboratory, Budapest.

² League of Nations: "The Problem of Nutrition", Vol. III, page 30.

rural population density is extremely high and the results of recruiting are stated to show a high percentage of physically unfit. No comprehensive assessment of the nutritional status of the rural population is available. Certain details are, however, available regarding urban workers. An official investigation¹ of the budgetary accounts of 192 families of industrial workers made in 1927 showed a total calorie intake of 2,856 calories per consumption unit per day, with the intake of the lowest income group less than 2,400 calories. Protein intake was 65.6 grammes, of which 25.4 grammes of animal origin (13 grammes in the case of the lowest income group); fat intake, 53.7 grammes; and carbohydrate intake, 507.9 grammes.

22. The conclusion which must be drawn from the evidence of the preceding paragraphs (fragmentary and incomplete though that evidence is) is distressingly clear. There can be no possible doubt that the problem of malnutrition is a real one and that it calls urgently for solution. In every country for which detailed information is available, it has been found that an appreciable proportion of the population is, for one reason or another, not getting enough of the foods which the modern science of nutrition considers necessary for health and efficiency. In some cases, the deficiencies in the diet have been shown to result in manifest disease. Even where this does not occur, there is reason to believe that millions of people in all parts of the world are not enjoying the degree of health and vigour which could be theirs with proper nourishment. To assess the cost of malnutrition—whether in human terms, through disease and sub-optimal health, or in economic terms, through loss of efficiency and the money spent in attempting to repair the damage done by faulty nutrition—would be an impossible task. The cost is incalculable; and there can be no doubt that, beside it, the cost of the measures which can be taken to improve nutritional standards—through education, through the lowering of food prices, through direct social provision or through other means—would appear insignificantly small.

* * *

¹ Statistique de la Pologne: "Budgets des familles ouvrières, 1927". (Warsaw, 1930.)

Asia.

23. The problem of nutrition in Asia falls outside the scope of this study, but it may be of interest to add here a few extracts from the report¹ of the Preparatory Committee of the Intergovernmental Conference of Far-Eastern Countries on Rural Hygiene, which will meet, under the auspices of the Health Organisation of the League of Nations, in Java in August 1937.

" Investigations into the state of health of the peoples of the East, no matter what their starting-point, lead back invariably to the question of nutrition. . .

" The prevailing opinion is that the state of nutrition of the populations of rural districts is not wholly satisfactory in any of the Asiatic countries. It is thought that, of the 1,150,000,000 inhabitants of that continent, not less than 75% have a diet below the standards fixed by European science. From various publications, and from the information that the Committee collected during its tour, it appears that a large part of the population is living on the border-line of the minimum requirements, while millions are even below that level.

" These statements should, however, be accepted with some caution, because an examination of the studies so far made in Asia shows that few accurate statistics are available. . . .

" Everything produced is always quickly consumed, and, so far from there being a limitation of crops, the dominant question everywhere is how to increase them. An exception may be made as regards a few articles intended for the world market, such as sugar and copra. . . .

" At present, the suggestions made (with a view to improving nutrition) are too often based merely upon individual enquiries on the spot or observations from Europe, and consequently they frequently prove to be quite wrong or economically impracticable. In Europe and America, for instance, one suggested means of improvement is to increase the consumption of milk, eggs, butter, meat, vegetables and fruit; but, in most Asiatic countries, any considerable developments in regard to the first three items are out of the question. In Asia, therefore, entirely different solutions will have to be sought.

" Some efforts in this direction have already been made. The soya bean and the foods prepared from it, including soya milk, have been one of the most important subjects of study in recent years. But a local acquaintance with the food problems of the Far East justifies the assumption that big improvements in the composition of the diet can be brought about by other means. . . .

" Carbohydrates form, throughout Asia, the chief ingredient in the daily fare. So far as they are digestible, they serve exclusively as sources of energy. . . . Although an excess of carbohydrate absorption may not be a bad thing in itself, the quantity of vitamins and mineral substances required by the organism in such circumstances is also apt to be greater. This is important for the study of the beriberi question.

¹ League of Nations, Health Organisation: " Intergovernmental Conference of Far-Eastern Countries on Rural Hygiene: Report by the Preparatory Committee " (document C.H.1234—Ser. L.O.N. P. 1937.III.3). Geneva, 1937.

“ In the case of most Asiatic peoples, the daily protein intake is very small. Of those proteins, from 80% to 95% are vegetable. It is only in the diet of the relatively prosperous classes that animal proteins predominate . . . the percentage of protein in the food of inhabitants of the tropics ought not to be too large. . . .

“ Another question is whether a better grouping of proteins can be obtained by selection of different soils or of particular manures. A great deal can be done for these countries by proper collaboration between the different experts. . . .

“ The quantity of fats consumed by the various peoples of the Far East is much smaller than in Europe, and, further, the fat is mainly of vegetable origin.

“ In some countries, the proportion of vegetable fat amounts to 95%. A more detailed study of conditions as regards vegetable and animal fats is desirable if the question of nutrition in Asia is to be fully understood. . . .

“ Beri-beri, the first known form of vitamin deficiency, is localised mainly in Asia. Now that we know how to prevent it, adequate measures have been taken in most countries. In the majority of countries, it occurs only sporadically. Indeed, beri-beri has never been widespread among rural populations; it is connected rather with towns, armies, shipping, prisons, schools and large undertakings—in short, places where catering is collective.

“ According to the data we have collected, pellagra does not play an important part in any of the Asiatic countries. . . .

“ For the sunny countries of Asia, rickets does not constitute a problem of any importance, at all events where there are no particular habits of life or circumstances which preclude exposure to the sun.

“ Wherever a detailed study of the teeth has been made in the countries of Eastern Asia, particularly among children and young persons, the findings have been unsatisfactory. Caries is commoner than was once thought. . . .

“ The real cause lies in the diet. . . .

“ In recent years, it has become more and more evident that various forms of anæmia may be due to an unbalanced or insufficient diet. . . . These forms of anæmia are found particularly among women, and more especially pregnant women. . . . If the question of the influence of diet on the composition of the blood has already proved of great importance for European and American countries, how much greater must its importance be in Asia, where diseases such as malaria, ankylostomiasis, kala-azar and others constitute a far-reaching menace to that most important element of life, the blood? These diseases have a powerful ally in under-nourishment, which undermines the power of resistance of whole groups of the population.

“ Infant mortality is exceptionally high in all Asiatic countries. In several of them, it accounts for more than half the total mortality. It is true that the statistics are still far from reliable, except for Japan, but that the position is unfortunately as stated is beyond question. If the cause is sought, the direct or indirect significance of the factor of nutrition immediately comes into prominence. . . .

“ Accordingly, the question of milk and foodstuffs to replace milk is of the greatest importance in Asia. The study of soya milk is being conducted on these lines; at the same time, attention has been unduly fixed on this, and the search

for other resources which might be discovered through collaboration with agricultural and veterinary services has been correspondingly neglected. Closer attention should be given to improved milk powders and varieties of sour milk. This would be a highly desirable task, particularly for health centres. A great deal can be done with relatively simple and inexpensive means. In another respect, infants have certain advantages in Asia: in sunny countries, they can be exposed daily to ultra-violet rays, so that there is very little likelihood of their being infected with bovine tuberculosis; and countries with abundant fruit and vegetables throughout the year provide an inexpensive supplementary diet of bananas, citrus fruit juice, etc. . . .

“ In several countries, however, diseases of the respiratory organs in children and young persons are common, and it seems hardly likely that diet is not to some extent accountable. There is clear evidence to show that, when food is scarce or unobtainable, the number of fatal cases of lung disease greatly increases. More exact data are urgently required on this point. . . .

“ Recently, evidence has been obtained which seems to show that the (vitamin) B complex also has considerable influence, especially on certain skin diseases. This is important, because it is precisely in the East that the B complex requires constant control in the diet.

“ In Asia, sick children are in great danger of incurring vitamin-A deficiency. In Europe, a sick child, particularly if suffering from intestinal troubles, is placed on a diet consisting largely of milk. In Asia, the place of milk is often taken by gruel; vegetables are withheld, so that the child's food is almost devoid of vitamin A. . . .

“ Lastly, investigations have been made into the part played by diet in various other diseases, such as tuberculosis, leprosy and the innumerable leg ulcers that are found in Oriental countries.

“ As regards the first, a great deal of work has been done in Europe, and it has been proved that under-nourishment plays a prominent part in the development of tuberculosis. As regards the connection between nutrition and leprosy, various investigations have been made in recent years, and some definite results seem to have been arrived at; but these investigations are still only in their initial stage.

“ As for the large leg ulcers, the general view at present is that diet plays a predominant part. Their occurrence is said to be attributable not so much to the absence of a particular vitamin as to general under-nourishment. . . .

“ In agricultural areas in Europe, it is found that 50 or 60% of the earnings of the working-class is spent on food. In Asia, the percentage is much higher. The subject has been very little studied, but the available data show that there are large areas where this proportion is 90% or even higher. Now, the possibility of improving the diet in quantity and in quality depends upon the state of the family finances. If 80 or 90% of the budget has to be spent on the most essential food—and such is undoubtedly the case in many parts of Asia—all efforts must be directed to reducing prices and to teaching the people wisdom in the choice and preparation of their food.

“ In such cases, any recommendation to improve the diet—for example, by increasing the consumption of milk and eggs—is quite useless; the proper course

is to find which of the foodstuffs approximate nearest to the food value of these articles. Progress along these lines has already been made in some countries by introducing the use of the soya bean and its derivatives, and in other countries by stimulating the consumption of fish and fish pastes. . . .

"A well-fed and healthy population is vital to every country for its development and future. But, in all Asiatic countries, only relatively trifling sums are allocated to the detailed study of national nutrition or to attempts to improve it. . . .

"The growth of the population and the ensuing increased importance of adequate nutrition will certainly help to wean most Governments from this shortsighted policy. The assertion often made by the authorities that very primitive peoples show an unflinching intuition in regard to their food supply in time of need is obviously exaggerated, and, indeed, is contradicted by practical experience. A small measure of intuition there certainly is, but it can easily be overrated. . . .

"The aim must be so to organise the work as to obtain the most efficient collaboration of all who are able and willing to take part in it. We have in mind co-operation of chemists, both analytical and synthetic, physiologists, physiological chemists, specialists in internal medicine, pediatricians, gynaecologists—in short, representatives of almost all branches of medicine and hygiene; and, in addition, agriculturists expert in the growing of fruit and vegetables, veterinary surgeons and, lastly, statisticians and economists. . . .

"It is certain that, in Asia, international collaboration in this field is urgently needed."

Colonial Areas.

24. The information at present available regarding the diet of native populations of colonial areas is not sufficient to form the basis of a comprehensive picture. In April 1936, the British Colonial Secretary addressed a circular letter on the subject of nutrition to the Governments of His Majesty's colonial possessions, directing their attention to the importance of the problem and requesting that a comprehensive survey of the position be made in each dependency. When these surveys have been made, much more information will no doubt be available regarding nutrition in colonial areas. For the present, however, it is necessary to rely on the observations of independent investigators.¹

25. Conditions, of course, differ widely in different colonial areas, but a recent careful analysis of the available material led to the conclusion that colonial populations in general are under-

¹ Certain observations have been collected by BURNET and AYKROYD in "Nutrition and Public Health" (*Quarterly Bulletin of the Health Organisation of the League of Nations*, June 1935); the present section is based on that document.

nourished.¹ In certain parts of Africa, the native is now always assured of a regular and constant food supply; after a good crop, he may enjoy a liberal diet for a time and, after a poor crop, he may fast. It is stated that the diets of native populations in African, Asiatic and Oceanic colonies tend, in spite of local differences, to show the same defects: "they are often insufficient in quantity and unsatisfactory as regards quality, in that they contain inadequate amounts of animal protein, mineral salts and vitamins. As a result, resistance to infection is low and infant mortality high. It is scarcely fanciful to ascribe the low birth rate observable in certain parts of Africa and Asia to dietary deficiency".

26. The protein intake of native populations in the tropics and the East is usually low. "All protein and fatty foods" in the mandated territory of New Guinea "are considered luxuries,"² and "the staple diet is mainly carbohydrate". Formerly, according to information supplied to the Mixed Committee by the Australian Government in 1936, "cannibalism was a definite adjunct to the protein diet, and this is not to be wondered at, considering the extreme scarcity of almost all forms of game in the territory" (of New Guinea). In the territory of Papua, the protein supply of the rural villages is occasionally supplemented with kangaroo-meat or pig, "but the amount cannot be very great".

Pastoral tribes are better off in this respect than those engaged in tillage. Thus, the Masai in British East Africa, who live mainly on meat, milk and blood, have a protein intake of 100-200 grammes daily. The bulk of the diet of most native African populations is, however, composed of cereals. Thus, in Morocco, it has been observed that increased prosperity results in the substitution of wheat for barley, meat consumption remaining low. In South Africa, maize forms a large part of the native diet and there is an "insufficiency of meat, milk, grain and vegetables". There is a prejudice in favour of white maize, which is deficient in vitamin A; "mealie food" also lacks vitamin C and, "as a result, native labourers often arrive in mines in a state of latent scurvy, which is cured (in spite of heavy work output) by the liberal diet supplied in the mines". The diet of the African native is generally deficient

¹ *Op. cit.*, page 126.

² League of Nations: "The Problem of Nutrition", Vol. III, page 20.

in animal fat; the fats most commonly consumed in many districts are palm oil and peanut oil.

27. In considering the incidence of deficiency diseases in native populations, account must be taken, not only of diet, but also of the profound changes in the character of the life and work of many native peoples during the past fifty years. Work on roads and railways and portorage work have "disturbed the easy traditional routines of the native and often subjected him to unaccustomed physical strain". According to one authority, the effects of malnutrition became noticeable in the natives of Morocco only when they were engaged in regular work on European lines.

28. "Disease and ill-health due to vitamin deficiency are common throughout the tropics and the Far East. Xerophthalmia exists in Uganda and Kenya. Night-blindness and keratomalacia, due to vitamin-A deficiency, have been observed in many parts of Asia and Africa. Other manifestations of vitamin-A deficiency, affecting the mouth and the skin, have been noted in Ceylon and West Africa and probably exist in many other regions. Adult and infantile beriberi, closely related to vitamin-B₁ deficiency, are found wherever milled rice is used as staple cereal; many observers have commented on the waste and danger involved in the decortication of rice consumed by native populations. Scurvy has been observed among native adults in South and East Africa. Deficiency of vitamin E may play a part in reducing fertility in many tropical and Eastern countries. Apart from the recognised food-deficiency diseases, there can be little doubt that a vast amount of ill-health in the tropics and the East is due to the consumption of a diet deficient in vitamins and other food factors." ¹

¹ BURNET and AYKROYD: *op. cit.*, page 129.

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* * *

Further see:

Quarterly Bulletin of the Health Organisation, Vol. IV, No. 2, June 1935, containing an article by Et. BURNET and W. R. AYKROYD, entitled Nutrition and Public Health.

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